WOMEN & DIABETES

10 Relevant Health Topics for Women Living with Diabetes

Advancing Women's Health through Prevention, Diagnosis, Treatment and Management

2015





Dear Readers.

DiabetesSisters and the Society for Women's Health Research (SWHR®) entered into a partnership to raise awareness about diabetes in women, primarily with a focus to educate women living with diabetes, diabetes educators and healthcare providers on a variety of important topics identified by experts in the diabetes field.

These topics are specific to women living with diabetes and range from prevention, management, interventions and disparities. Some of the topics further relate to different hormonal milestones during a woman's lifespan.

We sincerely hope that this report will bring awareness to various stakeholders in the diabetes community and advance discussions on topics pertaining to prevention, diagnosis, treatment and management of diabetes in women of different demographics.

Sincerely,

ana Date.

Anna Norton, MS CEO **DiabetesSisters**

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Phyllis Greenberger, MSW President and CEO The Society for Women's Health Research



DiabetesSisters is a national 50Ic3 non-profit organization whose Diabetes Sisters mission is to improve the health and quality of life of women with diabetes, and to advocate on their behalf. Since its founding in 2008, the organization has offered online and in-person programming

focusing on the social and emotional well-being of all women living with diabetes, including blogs, expert articles, webinars, newsletters, and weekend-long conferences. The organization's website www.diabetessisters.org - receives over 440,000 visitors annually.



The Society for Women's Health Research (SWHR®) is the thought leader in research on biological differences in disease and is dedicated to transforming women's health through science, advocacy, and education. Founded in 1990, SWHR aims to bring attention to the variety of diseases and conditions that uniquely or

disproportionately affect women. Due to SWHR's advocacy efforts, women are now routinely included in most major medical research studies and scientists are considering sex and gender as a variable in their research. Visit www.swhr.org for more information.

Diabetes Sisters and Society for Women's Health Research. Women & Diabetes 10 Relevant Health Topics for Women Living with Diabetes. 2015. Washington, DC; Norton A, Gallagher AM.

If you have any questions or would like more information, please contact us at science@swhr.org.

EXECUTIVE SUMMARY

Women & Diabetes: 10 Relevant Health Topics for Women Living with Diabetes

Diabetes mellitus is a metabolic disease characterized by the body's inability to produce or properly use insulin. When insulin is not present or is ineffective, glucose accumulates in the bloodstream causing hyperglycemia. As a result, high **blood glucose** levels can adversely affect nearly all body systems and cause cardiovascular disease, retinopathy, nephropathy, neuropathy, dementia and depression, for example. There are three major subgroups of diabetes: type 1, type 2 and gestational diabetes mellitus. A condition known as prediabetes occurs when blood glucose levels are higher than normal, but not enough to be diagnosed as diabetes. Diabetes is a significant public health concern in the United States and is estimated to cost \$322 billion dollars annually.' Over 29 million people are living with type I (TID) and type 2 (T2D); which is I out of II people.² Women of color, particularly African American and Hispanic women, are 2-4 times more likely to be diagnosed with diabetes.³ Additionally, it is estimated that there are over 86 million people living with prediabetes and 9 out of 10 people are unaware that they have this condition.² While the rates of women and men with diabetes are similar, diabetes affects women and men differently. This is of concern as women make approximately 80% of the health decisions for their families and are usually the caregiver for family members who become ill.⁴ Thus, by maintaining the health of women living with diabetes, we are helping to ensure the health of the entire family.

TID affects about 5% of the US population¹ and has a genetic component, although individuals with no family history of diabetes can also develop it.⁵ TID usually develops when the body's immune system destroys the insulin-producing cells in the pancreas, prohibiting the production of insulin. It can also develop when certain cells of the pancreas get destroyed by other means. Approximately 95% of cases are T2D¹ which is caused by a combination of genetic and environmental factors. T2D develops when the body does not make enough insulin and/or the body becomes resistant to normal or high levels of insulin. Before being diagnosed with T2D most individuals go through prediabetes. There are usually no clear symptoms of prediabetes, thus most individuals are unaware of their condition. **Gestational diabetes mellitus (GDM)** affects up to 9% of pregnant women and is caused by a combination of genetic and environmental factors. More prediabetes are at increased risk for developing T2D later in life.⁶

Symptoms of diabetes include the need to urinate frequently, a sense of thirst, irritability, fatigue and/ or blurred vision, but some symptoms may go unnoticed.⁷ Healthcare professionals can determine if a woman has diabetes through a fasting blood glucose test, hemoglobin **AIC** or the oral glucose tolerance test. TID and T2D can be managed by monitoring blood glucose levels and taking medication as prescribed. Optimal health of a woman living with diabetes can be achieved by regular **blood glucose monitoring** in order to avoid **hypo-** and **hyperglycemia**. Additionally, taking medication as prescribed and maintaining a healthy diet, active lifestyle and open patient-healthcare provider relationships are ways in which women can help ensure and maintain good health.

T2D and its side effects can be prevented or delayed with healthy eating and regular physical activity. Diabetes is a condition that can change over time. Women may experience unique health concerns associated with diabetes over their lifespan, specifically as hormones fluctuate. These hormonal milestones include puberty, pregnancy and **menopause**. The primary female hormones - estrogen and progesterone - are known to affect how well insulin affects blood glucose levels. These hormones are predominately produced by the ovaries and play a role in one's physical and psychological well-being.

Women, healthcare providers, healthcare educators and the research community can help the community better inform and improve the health of women living with diabetes. This report was developed to bring attention to topics that are of interest to women and the healthcare providers and educators who interact with them. We hope that this will further discussions between the research and healthcare communities and address the needs of women living with diabetes in order to improve their quality of life. We encourage you to share this with other women, healthcare providers and educators, support groups, and online through social media outlets so that we can continue to strengthen and ensure the health of women living with diabetes. For any inquiries regarding this report, please contact the Society for Women's Health Research at science@swhr.org or 202.223.8224.

Sincerely,

Aimee M. Gallagher, MPH, MS and Anna Norton, MS

This report discusses ten topics relevant to women living with diabetes. These topics cover a wide range of topics from prevention, diagnosis, treatment and management.

Diabetes experts were asked to provide a list of important topics concerning the health of women living with diabetes. Following a compilation of all these topics, the experts were asked to complete a survey and choose the topic most relevant to women living with diabetes. The final list of chosen ten topics is listed here.

- I. Distinct psychosocial challenges experienced by women with diabetes
- 2. Better integration of psychological support and interventions for women in primary healthcare
- 3. Effective screening and interventions for eating disorders in women with diabetes
- 4. Prevention of cardiovascular disease in women with diabetes
- 5. Cardiovascular consequences of diabetes manifest differently in women than men
- 6. Estrogens influence glucose control in women living with diabetes
- 7. Sexual desire and dysfunction in women living with diabetes
- 8. Planning for a healthy pregnancy in women with type I diabetes
- 9. Interaction of menopausal symptoms with blood glucose levels
- 10. Elimination of diabetes disparities between women of color and white women



Gary Scheiner, MS, CDE and Diane Herbert, CDE, MSS, LSW

Many psychosocial challenges are experienced by women living with diabetes due to the fluctuation of hormonal levels during the menstrual cycle, pregnancy and **menopause**. For instance, fluctuations in hormonal levels during the menstrual cycle may create altered mood states, which can lead to undesirable changes in exercise patterns and food choices. These mood states may be due to the negative impact of hormonal changes on blood glucose control, when women may experience insulin resistance prior to menstruation and then see a drop in blood glucose levels following menstruation. In fact, progesterone levels during menstrual cycles (during luteal and follicular phases) create alternating states of **insulin resistance** and **insulin sensitivity**⁸ that may contribute to these mood changes⁹. A woman's ability to cope effectively and maintain consistent self-management behaviors during various phases of the menstrual cycle is necessary for maintaining *euglycemia*.

Similarly, many women struggle to meet the ambitious goals established by their healthcare professionals before and during pregnancy. Pregnancy creates a series of changes to a woman's insulin sensitivity and ability to produce insulin. During this time, women may experience feelings of guilt, anxiety and inadequacy. Adding to this problem is the lack of qualified healthcare professionals who can adequately provide medical and socioemotional care for pregnant women with diabetes. The ability to maintain consistent, in-range blood glucose control through the various stages of pregnancy requires meticulous attention to details, frequent therapy adjustments and expert guidance.

During perimenopause and menopause, women with diabetes may experience frustration and feelings of helplessness because of blood glucose inconsistencies. Unlike menstrual cycle patterns, which tend to occur on a repeated and somewhat predictable basis, hormone changes during menopause tend to be highly erratic leading to problems such as depression, anxiety¹⁰ and problems sleeping.¹¹

Body image dissatisfaction and body image concerns related to societal pressures can also pose a widerange of challenges for women with diabetes. Potential challenges range from mild to life threatening. Challenges may include anxiety and stress related to: the need to carry diabetes supplies on-person; **insulin pump** placement when wearing form-fitting garments without pockets or waistbands; and wearing infusion devices or blood glucose sensors on the skin continuously. Additional concerns can include development of scar tissue from overused injection/infusion sites; finger scarring from **self-monitoring blood glucose (SMBG)**; **lipodystrophy** and worries over weight gain when intensifying blood glucose control. Further challenges pertain to disordered eating patterns and insulin/medication omission or manipulation. Up to one-third of all women with TID have engaged in insulin deprivation for the purposes of weight control.¹² **Diabulimia**, clinically known as ED-DMTI, is an eating disorder in which the individual reduces or eliminates insulin to lose weight and it most often affects adolescent and young adult women. Women with TID are more than twice as likely to develop an eating disorder compared to women of the same age without diabetes.¹³

Due to the continuous emphasis on individuals with diabetes regulating and quantifying food intake, SMBG levels and minimizing heart disease risk further exacerbates the risk of body image dissatisfaction in women with diabetes.

Better integration of psychological support and interventions for women in primary healthcare

Rhonda Merwin, PhD

Psychological health issues, such as anxiety and depression, negatively impact diabetes selfmanagement. ¹⁴⁻¹⁶ Women are more likely than men with diabetes to report anxiety^{17, 18} and are more frequently diagnosed with depression compared to men.¹⁹ The **American Diabetes Association's** (**ADA**) Standards of Medical Care in Diabetes for healthcare professionals²⁰ highlight the importance of addressing psychological barriers when diabetes treatment goals are not being met and recommend assessing common comorbid conditions (e.g. depression and eating disorders) that may complicate diabetes management on an ongoing basis. They also suggest treating these conditions using a stepwise collaborative approach. This approach may involve multiple members of the individual's healthcare team and may begin with lifestyle modifications and progress to the addition of oral medication or subcutaneous insulin or an insulin pump.²¹ Specific recommendations by the healthcare team may be needed regarding routine screening in primary care and treatment of psychological issues among women living with diabetes.²²

Addressing psychological health issues in the context of routine patient care can be efficient and effective; however, how best to do so is unclear. As a result, there is a lack of integrated care, and most individuals are referred to outpatient psychological treatment programs, with diabetes and psychological health concerns treated separately. Studies have demonstrated the feasibility and preliminary effectiveness of using group-based interventions within primary care to improve diabetes management.²³⁻²⁵ These programs sometimes include psychosocial concerns, such as stress and the emotional aspects of diabetes and may be one avenue to provide these needed clinical services. However, psychological health is currently not the focal point of these interventions and psychological outcomes are rarely assessed. More research is needed to determine how to advance group-based interventions in diabetes care or develop other collaborative care models for women

with diabetes who have emotional issues that are impacting management. Studies are also needed to maximize the impact of intervention while minimizing patient and healthcare provider burden. This might include making greater use of mobile technologies which are increasingly being used to assess adherence and self-care behaviors in diabetes.^{26, 27}

Effective screening and interventions for eating disorders in women with diabetes

Rhonda Merwin, PhD

Although eating disorders are a problem among girls and women with T1D and T2D, relatively more attention has been given to eating disorders in T1D.²⁸ This is likely due to the high presence of the unique and dangerous symptom of insulin restriction for weight control in this population.²⁹

Studies show 30-40% of young women with TID struggle with symptoms of eating disorders,³⁰⁻³² including caloric restriction, binge eating, insulin omission for weight loss, among other behaviors. A woman with an eating disorder and TID has three times the risk of developing early and severe retinopathy, neuropathy and nephropathy and a 3-14 fold increased risk of premature death.^{29, 33-35} Current evidence suggests that eating disorders and disordered eating behaviors below **clinical threshold** among girls and women with TID last for 4 years or more and can reoccur.

Women with T2D are more likely to suffer from **binge eating disorder**. Prevalence estimates show approximately 2.5% - 25.6% of women with T2D also have a binge eating disorder.³⁶⁻⁴⁰ Eating disorder symptoms appear to be linked to symptoms of depression and potentially occur before the onset of diabetes.^{39,41} Previous reports suggest that the effects of eating disorder symptoms on T2D management is likely underreported and underappreciated.⁴¹

The ADA recommends screening for eating disorders, starting in preadolescence and continuing through early adulthood for women with TID.⁴² Currently, there are no approved, brief screening tools that provide primary care providers with reliable results to identify eating disorders in this population. Most of the research for developing a screening tool appropriate for women living with diabetes has been adapted from tools used in non-diabetic populations. The best and most reliable method of screening this unique population to fully capture diabetes-specific variations of eating disorder symptoms (e.g. insulin misuse to lose weight) is unknown.

Interventions for women with diabetes and eating disorders are underdeveloped and understudied. Treatment relies heavily on conventional treatments for eating disorders, rather than being based on models that are unique and specific to diabetes.^{43, 44} Among individuals with TiD, treatment studies mostly document the intractability of eating disorder symptoms^{43, 45} and the inability of existing interventions to improve insulin dosing even when eating and weight-related attitude changes do not always work.⁴⁶ Residential programs, in which staff oversee insulin administration, may help patients achieve improved metabolic control.^{47, 48} Residential programs are rare, inconvenient and expensive as evidenced by high drop out rates.⁴³ Additionally, it is unclear whether treatment effects are carried through when individuals return to their daily lives. Among individuals with T2D, treatment studies are equally sparse. Some studies suggest additional development of group based cognitive behavioral therapy and family-based treatment with spouses for women with T2D and binge eating disorders or **obesity**.^{49, 50} However, more research is needed to diagnosis, treat and manage eating disorders in women with all types of diabetes.

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Amy Huebschmann, MD, MS, FACP

Many people know that cardiovascular disease is the leading cause of death for women with diabetes, but not all women with diabetes are aware of how to reduce this risk. An important way to reduce the risk of cardiovascular disease is to think about your ABCs - Aspirin, Blood Pressure control, and Cholesterol control. However, these ABCs are not as simple as they sound. For example, daily aspirin use reduces the risk of heart attack or stroke for certain people with diabetes but not others. In addition, aspirin use is not without potential harm, as it can increase the risk for serious bleeding complications. The following information reviews what is already known about the ABCs of cardiovascular prevention for women and men with diabetes, respectively, and it also highlights important areas for future research.

A – Aspirin

The benefits of taking a daily aspirin are different for people with diabetes who have already experienced a heart attack or stroke than for people with diabetes who do not have cardiovascular disease. Scientists analyzed data from 13 studies including patients with diabetes who had a prior heart attack or stroke and found that taking aspirin lowered the risk of death by 18% compared to individuals that are not taking aspirin.⁵¹ In contrast, among people with diabetes and no cardiovascular disease, the same scientists found that aspirin therapy did not improve death rates. To prevent cardiovascular disease, the ADA recommends that both women and men with diabetes and a history of cardiovascular disease should take low-dose aspirin therapy of 75-162 mg daily.⁵²

In the studies discussed above, scientists did not analyze whether effects of aspirin varied between those with T1D versus T2D; nor was it clear whether effects differed between women and men.⁵¹ Two other studies suggest that the benefits of aspirin may be different for women and men with no cardiovascular disease. One of these studies examined sex differences with regards to the benefits of aspirin for preventing heart attacks. In people with diabetes and who did not have a prior history of cardiovascular disease, daily aspirin use led to a 43% reduction in the risk of heart attacks among men with diabetes but no significant improvement for women with diabetes. Thus, it is not at all clear that daily aspirin use is beneficial for women with diabetes who have not had a prior heart attack or stroke, and this is an important area for future research. Based on the existing data, the most recent 2010 recommendations from the American Heart Association, the American College of Cardiology, and the American Diabetes Association make the following recommendation for adults with diabetes and no prior history of cardiovascular disease:

• Low-dose aspirin (75-162 mg daily) should be considered for individuals with a moderately elevated risk of cardiovascular disease who do not have an increased risk of bleeding: this group includes men who are aged 50 years and older and women aged 60 years of age who also have at least 1 additional risk factor for cardiovascular disease, such as high **blood pressure** or high **cholesterol**, in addition to diabetes.

B- Blood Pressure

For both women and men with diabetes, there are clear data from randomized controlled trials that show that good blood pressure control reduces the risk of developing a heart attack or stroke.⁵³ What is less clear is the optimal blood pressure goal for people with diabetes. In 2013, both the American Diabetes Association and the 8th Joint National Committee on Hypertension loosened their previous blood pressure targets of 130/80 mm Hg to a new standard of less than 140/90 mm Hg. This change was based on concerns from some recent trials that more aggressive blood pressure targets lead to an increased frequency of serious consequences. For example, the ACCORD trial compared outcomes in patients with T2D for a more aggressive blood pressure goal of 120/80 mm Hg as compared to a more conservative goal of 140/90 mm Hg. The patients treated to a goal of less than 120/80 experienced

a nominal 0.2% decrease in the annual risk of a stroke that was accompanied by a significant increase in serious adverse events, such as seriously low blood pressure or an abnormal heart rhythm.⁵⁴ The data from ACCORD and another recent large trial that compared the effects of more aggressive blood pressure targets with looser blood pressure targets in patients with T2D did not report their results separately for women and men, so this is an important gap in the current base of research evidence.^{54,55}

Recently, experts who specialize in sex differences in diabetes and cardiovascular disease have called attention to the need to consider whether **hypertension** treatment should be tailored differently to women and men with diabetes.⁵⁶ These experts reported that sex differences are important for several reasons, including concerns that control of blood pressure is worse in women with diabetes than in men with diabetes, and possible sex differences in the causes of hypertension for women and men with diabetes.⁵⁷ Further research should investigate sex differences in the treatment goals and causes of hypertension for people with diabetes.

C - Cholesterol

Experts have widely recognized that cholesterol treatment with statins has had a revolutionary impact on the reduction of cardiovascular risk.⁵⁶ Based on the data, current guidelines from the American Heart Association and the American College of Cardiology recommend statin treatment for women and men with diabetes who are older than 40 years.⁵⁸ One caveat to this recommendation is that statin use during pregnancy has a possible link to birth defects; thus, statins are generally not recommended during pregnancy.⁵⁸ A report that assessed the benefits of statins in previous studies found that women and men with diabetes experienced a significant reduction of 17% and 23%, respectively, in risk of cardiovascular disease.⁵⁹ These studies included far fewer patients with T1D than with T2D, but it appears that the magnitude of benefit is likely to be similar in both T1D and T2D.⁶⁰ These studies have led to the conclusion that among both women and men with diabetes who have a prior history of heart attack or stroke, statins are highly effective to prevent a future heart attack or stroke. There are less data on the benefits of statins in women with diabetes and no prior history of heart attack or stroke, but it is reasonable to expect that the benefits would also extend to this group.⁵⁶ An area that is important for future research is that women with diabetes appear less likely to take statin medications as compared to men with diabetes. Some possible reasons for this disparity are a greater risk of muscle pain as a side effect of stating in women than men, and the possibility that healthcare professionals may prescribe statins less to women with diabetes than to men with diabetes.⁵⁶

Overall, it is clear that following the ABCs of cardiovascular prevention in addition to appropriate

blood glucose control, healthy nutrition and regular physical activity should lead to optimal heart health for women with diabetes. Women with diabetes should discuss these ABCs with their healthcare professional to personalize these general recommendations to their own medical history. In order to treat all people with all types of diabetes optimally, future research should target a better understanding of when and how to tailor the ABCs of cardiovascular prevention appropriately to the specific and different needs of women with diabetes and men with diabetes.



Cardiovascular consequences of diabetes manifest differently in women than men

Amy Huebschmann, MD, MS, FACP

Among both women and men with T2D, cardiovascular disease causes over half of all deaths and over 75% of hospitalizations.⁶¹ However, there are commonly different cardiovascular manifestations of diabetes in women than in men.⁵⁶ For example, women with diabetes have 4.5 times greater risk of death from heart attack or stroke than women without diabetes, whereas men with diabetes have a 2-fold greater risk of death from heart attack or stroke as compared to men without diabetes.⁶² In addition, there is a 3-fold greater risk of death after a heart attack in women with diabetes as compared to men with diabetes.^{62,63} More broadly, sex differences are present for several different cardiovascular risk factors and cardiovascular outcomes for women and men with diabetes (Table 1).⁵⁶

Cardiovascular Risk factors	
Obesity	Obesity more common in women than men; Storing more fat in the abdomen (abdominal adiposity) is a stronger cardiovascular risk factor in women than in men
Hypertension	In adults >60 years, hypertension more common in women than men
Hypertension control	Hypertension control is worse in women than in men
Glycemic control	AIC levels under worse control in women than in men

Table I. Sex Differences in cardiovascular risk factors and cardiovascular outcomes for women and men with diabetes

Cardiovascular outcomes	
Heart attack (myocardial infarction)	After heart attack, higher risk of death is 3-fold greater in women than in men
Stroke	Diabetes is a stronger risk factor for stroke in women than men
Peripheral arterial disease	Women are more likely than men to develop claudication pain in legs
Heart failure	Risk of developing heart failure is greater in women than in men

The reasons for the sex differences in cardiovascular manifestations of diabetes are not fully understood.⁵⁶ Possible explanations for worse cardiovascular outcomes in women with diabetes than in men with diabetes include worse risk factors of cardiovascular disease, such as worse cholesterol levels and storing more fat in the abdomen. Some data also suggest that women with diabetes may experience worse outcomes than men with diabetes because men have significantly better control of their cardiovascular risk factors of blood pressure and blood glucose than their female counterparts with diabetes.⁵⁶

Because there are significant cardiovascular health disparities between women and men with diabetes, researchers have recommended some particularly important targets for future research on sex differences:

- I. Because many of these studies included patients with both TID and T2D, further research should assess sex differences in cardiovascular disease for people with TID separately from people with T2D.
- 2. Assess sex differences in biological predictors of cardiovascular disease, such as how sex hormones influence the causes of cardiovascular disease and heart failure differently in women and men with diabetes.
- 3. Determine sex differences in the responses to medications for cardiovascular disease in people with diabetes.
- 4. Identify sex differences in the responses to medications for congestive heart failure in people with diabetes.
- 5. Assess sex differences in lifestyle interventions to improve cardiovascular-related outcomes or cardiovascular risk factors.



Estrogens influence glucose control in women living with diabetes

Franck Mauvais-Jarvis, MD, PhD

Despite extensive research work in preclinical models on the importance of **endogenous estrogen** in preventing diabetes,⁶⁴ the role of endogenous estrogen in glucose metabolism in women is still poorly understood. Most studies agree, however, that **menopause** is associated with an increase in abdominal fat, which predisposes women to insulin resistance and subsequently T2D.^{65, 66} In addition, it is believed that decreased estrogen action in muscles and liver after the onset of menopause directly promotes **insulin resistance**.⁶⁴ Finally clinical evidence also suggests that postmenopausal women have decreased insulin secretion.⁶⁷

When postmenopausal women without diabetes were given **hormone therapy** (estrogen + progestin), they had a 30% reduction in the chance of developing diabetes.⁶⁸ For postmenopausal women living with diabetes, hormone therapy (especially oral conjugated estrogen or oral estradiol compared to transdermal estradiol) reduced insulin resistance by 36%. Thus, in general, this means that when hormone therapy is given to postmenopausal women with diabetes, they have better insulin control compared to women without diabetes representing a greater reduction of insulin resistance compared to women without diabetes. Overall postmenopausal women with diabetes who took hormone therapy had an improvement in AIC and fasting glucose or less frequently, no effect at all.^{66, 68} There is, however, insufficient evidence to recommend hormone therapy is not indicated for these purposes.⁶⁹ Further, in women with diabetes, hormone therapy should be an individualized approach in women without cardiovascular risk factors.

In women of reproductive age without diabetes, **combined oral contraceptives** (COC) containing ethinyl estradiol do not increase the incidence of diabetes.⁷⁰ In most studies, the use of COC in women with diabetes did not show any worsening of blood glucose control. Thus, COC can be prescribed

in women with T1D or T2D in absence of complications (e.g. retinopathy, nephropathy, cardiovascular-related) and in absence of vascular risk factors (e.g. obesity, **dyslipidemia**, hypertension, tobacco use). Thus, COC are a safe and effective option for women with diabetes without complications.⁷⁰



Sexual desire and dysfunction in women with diabetes

Wendy L. Bennett, MD, MPH

Multiple studies show that women living with TID and T2D are twice as likely to experience sexual dysfunction.⁷¹ Compared to women without diabetes, sexual dysfunction was more common in both premenopausal and postmenopausal women with diabetes. However, a more recent study in women with and without diabetes did not show any difference in rates of reported sexual desire or frequency of sexual activity by diabetes status.⁷² However, among women who reported being sexually active, those treated with insulin were twice as likely to report difficulty with lubrication and 80% more likely to report difficulty achieving orgasm, compared to women without diabetes.⁷²

Although evidence is lacking, diabetes may impact female sexual function through impaired urogenital blood flow, which could affect genital lubrication. Diabetic neuropathy could also reduce genital arousal response. It is also unclear whether any diabetes medications affect women's sexual function, since as it is not reported as a common adverse event in clinical trials.

Treatment for female sexual function include hormonal treatments, such as hormone therapy in postmenopausal women and testosterone.⁷³ Lifestyle factors such as diet, exercise and weight management have been shown to significantly improve female sexual function among women with diabetes.⁷⁴

Importantly, women generally do not seek help for sexual concerns, and healthcare professionals may not adequately screen for sexual problems.⁷³ In addition to future studies aimed at understanding mechanisms and management, we need to improve the care of women with diabetes around concerns related to sexual health and function.



Planning for a healthy pregnancy in women with type 1 diabetes

Susan Weiner, MS, RDN, CDE, CDN and Elizabeth (Libby) Downs, MS, RD, CDE

There are many unique complexities that come with managing pregnancy and TID. Therefore, it is important for a woman contemplating pregnancy to develop a close working relationship with a healthcare team before she attempts to become pregnant. Successful pregnancy outcomes are possible when proper counseling and management are provided by a healthcare team similar to the general population.⁷⁵

Achieving consistent, in-range blood glucose control before becoming pregnant is a cornerstone for women who live with TID. Efforts to regulate blood glucose before and during the early weeks of pregnancy significantly reduce the risk of negative outcomes for the baby, since the baby's organs are already formed by the seventh week after conception.⁷⁵ Before getting pregnant, the **ADA** recommends achieving an AIC level of less than 7% and some sources even recommend lowering the AIC to <6.5% .⁷⁵⁻⁷⁷

Aside from recognizing blood glucose patterns, knowing how to use insulin to carbohydrate ratios and correction factors allows a woman to adjust the pre-meal dose of insulin to match the grams of carbohydrates a woman plans to eat and can help her optimize glycemic control.⁷⁶ Accuracy of **carbohydrate counting** and administering mealtime insulin (fast acting insulin) 5-15 minutes before eating can promote even tighter control. In addition, women should consider adopting a healthy lifestyle, including a healthy diet, healthy weight, prenatal vitamins, moderate to vigorous activity and emotional wellbeing.⁷⁵

If a woman is not on an insulin pump, considering this as an option before getting pregnant may benefit her by offering greater flexibility while decreasing the fluctuations of blood glucose levels overnight.⁷⁶⁻⁷⁸ If a woman chooses to go on a pump or if she already has a pump, she needs to ensure that she has an alternative plan in case something happens and insulin delivery stops. Insulin needs will vary widely during the course of pregnancy due to fluctuating hormones and a progressive increase in insulin resistance.⁷⁸ Attending healthcare appointments is extremely important in order to get the support that is needed for adjusting insulin doses to compensate for low blood glucose levels during the first trimester and highs thereafter.

In order to prevent having a large baby and birth trauma, maintaining glucose control after the 12th week of pregnancy and keeping most glucose spikes under 129 mg/dL after eating is key.⁷⁸ If a woman's blood glucose level is > 180 mg/dL for 2 or more hours, she should test for urine **ketones** and call her healthcare professional if ketones are present as this can negatively impact the baby.^{76, 78} If the healthcare professional's office does not have the capacity to download the woman's insulin pump or glucose meter, keeping good records of blood glucose levels may better equip the healthcare professional to make appropriate insulin dose adjustments.

Although understudied in TID and pregnancy, a glucose sensor can be vital in identifying patterns which deviate from what is normally expected.^{76,78} It is also useful for those with hypoglycemia unawareness or a surge of glucose in the early hours of the morning.^{76,78} Unfortunately, a **continuous glucose monitoring (CGM)** does not take the place of testing blood glucose levels, but it can be very helpful in managing blood glucose levels.

Hypoglycemia is the most common adverse effect associated with intensive insulin therapy in T1D during pregnancy.⁷⁸ This is due to the body's decreased ability to produce a hormone response to a low which can dramatically impact glucose management during pregnancy, especially during the first trimester.⁷⁹ The low glucose threshold during pregnancy is therefore commonly recognized as a blood glucose of 60 mg/dL and may not be recognized by the woman until it drops even lower.⁷⁹ Many pregnant women experience hypoglycemia unawareness where they do not have warning symptoms of low blood glucose.⁷⁹ However, there is evidence to support that intensified glucose control prior to getting pregnant may reduce the amount of lows during pregnancy as well as help minimize hypoglycemia unawareness. Whether or not a woman has experienced hypoglycemia, she should take extra precaution when considering the timing of physical activity with insulin and consuming carbohydrates to minimize hypoglycemia.⁷⁹

The effects of hypoglycemia on the baby are not clear, but it can be life threatening to a woman.⁷⁹ If a woman does not have a glucagon emergency kit, she should obtain one and train individuals who she lives and works with to know when and how to use it. A woman should always be prepared to treat episodes of hypoglycemia. Due to the higher risk for lows, it becomes even more imperative to be ready to treat hypoglycemia by having something that's easily available – in a car, handbag, nightstand drawer, as well as identification stating the presence of T1D. If a woman's blood glucose is between 50-59 mg/dL, she should take 15 grams of glucose tablets or other fast-acting sources of glucose.⁷⁹ If blood glucose is less than 50, I cup of orange juice is recommended to help counteract the hypoglycemia.⁷⁹ It is important to test blood glucose levels 15 minutes after treating a low in case more carbohydrates are needed.

The support of a registered dietitian who specializes in diabetes can be invaluable when seeking tighter blood glucose control.⁷⁹ Aside from providing general nutrition and pregnancy guidance, a dietitian can develop a food plan individualized to a woman's preferences and specific needs during pregnancy. A woman's dietitian may advise her about how much weight gain is appropriate during pregnancy. The dietician can also be a resource if she needs support maintaining or slowing weight gain during the pregnancy. Otherwise this information should be given to the woman by her obstetrician.

Although much information is known on T2D and pregnancy, there are no specific instructions for women with T1D during pregnancy to follow a low **glycemic index**/load diet. However, the American Diabetes Association Standards of Medical Care have general nutrition recommendations that say: "Substituting low glycemic-load foods for higher glycemic-load foods may modestly improve glycemic control."²⁰

If not contraindicated by a healthcare professional, it is encouraged to engage in at least 30 minutes of daily low to moderate physical activity as part of overall diabetes management. Testing blood glucose closely around exercise and considering adjustments to insulin or carbohydrate requirements is recommended before, during and after the activity.⁷⁸ If blood glucose is <100 mg/dL before activity, eating carbohydrates without taking any rapid-acting insulin may be needed in order to minimize hypoglycemia.⁷⁸ If ketones are present, a woman should consult with her healthcare professional and avoid exercise until they are cleared.



Interaction of menopausal symptoms with blood glucose levels

Wanda Nicholson, MD, MPH, MBA

It can be challenging for women with diabetes to determine whether **menopause** is affecting their blood glucose levels or whether their blood glucose levels are affecting the intensity of their menopausal symptoms. Some menopausal symptoms are similar to those that occur with variations in blood glucose levels. Sweating, dizziness, mood changes, fatigue, vaginal dryness, vaginal infections and urinary tract infections can be caused high blood glucose levels^{80, 81} but can also occur as women transition to menopause.⁸² Regular blood glucose monitoring can help women understand whether low or high blood glucose levels may be causing their symptoms.

We also know that the hormonal changes that occur with menopause can directly affect blood glucose levels, even among women who previously had effective control of their diabetes.^{83, 84} With the transition to menopause, the ovaries are no longer functional and therefore, estrogen levels are greatly diminished. Progesterone levels are also decreased. It is believed that these hormonal changes can affect blood glucose levels. Women may express that they are experiencing fatigue or other symptoms that may be due, in part, to fluctuations in blood glucose levels.⁸³

Additionally, it is common for women to have additional challenges in regard to eating well and exercise with the onset of menopausal symptoms. Women can often gain weight, particularly central weight gain (increase in weight around the abdomen) with the transition to menopause.⁸³ Hot flashes interfere with the sleep cycle and can result in less interest in physical activity. These behavioral changes can subsequently cause variations in blood glucose levels and contribute to the ongoing cycle of menopausal symptoms and blood glucose control.



Elimination of diabetes disparities between women of color and white women

Angela F. Ford, PhD, MSW and Joshunda Sanders

Women of color are 2-4 times as likely to be diagnosed with diabetes compared to women of other races.³ Researchers believe that people of color in America inherited what is referred to as a "thrifty gene" which afforded them with a genetic adaption during feast and famine cycles. Now that there is more consistent access to food on a regular basis, this gene may presently put people of color at a higher risk for T2D.⁸⁵

Poverty, lack of access to healthcare, socioeconomic and psychological stressors connected with racial and gender disparities and cultural attitudes also contribute to the persistent disparities between African American women and white women related to diabetes prevention, diagnosis, treatment and management.

Diabetes is especially burdensome for African American women. Like other women of color, African American women are more likely to suffer from the risk factors associated with diabetes, including early onset obesity, and low socioeconomic status that contributes to poor nutrition and low physical activity.

T2D is one of the biggest health challenges facing African American women, with one in four African American women over the age of 55 living with diabetes. African Americans also experience high rates of at least two of diabetes' most serious complications: amputation and kidney failure.⁸⁶

In order to eliminate health disparities between African American women and white women, healthcare professionals and public health stakeholders need to begin raising awareness about the importance of prediabetes screening, which is when disparities in diagnosis often begin. African American women need to understand the importance of maintaining a healthy weight, eating wellbalanced, nutritious meals and being more physically active.

Preventive services, such as those that are largely free or lowcost through the **Affordable Care Act**, also increase the likelihood that African American women will get screened earlier. This would decrease late diagnosis, which often leads to more serious and devastating consequences of failing to address diabetes. Additionally, this would increase awareness of gestational diabetes.

Community based programs that provide social support and promote healthy eating and physical activity have been effective at reducing the incidence of diabetes in the African American community.⁸⁷ General support, diet supervision, medication assistance and blood glucose monitoring were also found to be beneficial in eliminating diabetes disparities.⁸⁸ Future research and programming should continue to build on these promising findings.



GLOSSARY

AIC - a test that measures a person's average blood glucose level over a 2-3 month period. Hemoglobin is the part of a red blood cell that carries oxygen to the cells and sometimes joins with the glucose in the bloodstream. Also called hemoglobin AIC (HbAIc) or glycosylated hemoglobin, the test shows the amount of glucose that sticks to the red blood cell, which is proportional to the amount of glucose in the blood.

Affordable Care Act (ACA) – also known formally as the Patient Protection and Affordable Care Act, is a United States federal statute signed into law in 2010. Under ACA, hospitals and primary healthcare professionals would transform their practices financially, technologically and clinically to drive better health outcomes, lower costs and improve their methods of distribution and accessibility. The law requires insurance companies to cover all applicants within a new minimum standards and offer the same rates regardless of preexisting conditions or sex. For those with diabetes, the ACA protects individuals by allowing them the same health insurance plans as everyone else. In the past, individuals with diabetes could be denied insurance.

American Diabetes Association (ADA) – a national nonprofit organization whose mission is to prevent and cure diabetes and to improve the lives of all people affected by diabetes.

Binge Eating Disorder (BED) – an eating disorder in which people frequently consume unusually large amounts of food and feel unable to stop eating.

Blood Glucose – the main sugar found in the blood and the body's main source of energy. Also called blood sugar.

Blood Glucose Monitoring – the act of checking blood glucose level on a regular basis in order to manage diabetes. A blood glucose meter (or blood glucose test strips that change color when touched by a blood sample) is needed for frequent blood glucose monitoring.

Blood Pressure (BP) – the force of blood exerted on the inside walls of blood vessels. Blood pressure is expressed as a ratio (example: 120/80, read as "120 over 80"). The first number is the systolic pressure, or the pressure when the heart pushes blood out into the arteries. The second number is the diastolic pressure, or the pressure when the heart rests.

Carbohydrate Counting – a method of meal planning for people with diabetes based on counting the number of grams of carbohydrates in a particular food.

Cardiovascular Disease – an umbrella term referring to diseases of the heart or blood vessels, including: hypertension, coronary heart disease, stroke and heart failure.

Certified Diabetes Educator (CDE) – a healthcare professional with expertise in diabetes education who has met eligibility requirements and successfully completed a certification exam.

Cholesterol – a type of fat produced by the liver and found in the blood; it is also found in some foods. Cholesterol is used by the body to make hormones and build cell walls.

Clinical Threshold - the level that must be reached for an effect to be produced.

Combined Oral Contraceptive (COC) – often referred to as the birth control pill or colloquially as "the pill", is a birth control method that includes a combination of an estrogen (estradiol) and a progestogen (progestin).

Continuous Glucose Monitor (CGM) – a FDA-approved device that provides real time blood glucose readings, throughout the day and night, allowing people with diabetes to see their blood glucose levels and track how quickly the levels are changing.

Diabetes Mellitus – a condition characterized by hyperglycemia resulting from the body's inability to properly use or produce enough insulin. In type I diabetes, the pancreas no longer makes insulin and therefore blood glucose cannot enter the cells to be used for energy. In type 2 diabetes, either the pancreas does not make enough insulin or the body is unable to use insulin correctly.

Diabulimia – an eating disorder which may affect those with type I diabetes. Diabulimia is the reduction of insulin intake to lose weight. Diabulimia is considered a dual diagnosis disorder, considered both a diabetes disorder and an eating disorder. While diabulimia is generally associated with use of insulin, an individual with diabetes may also suffer from another eating disorder.

Dyslipidemia – an abnormal amount of lipids (cholesterol and/or fat) in the blood. In developed countries, most dyslipidemias represent an increase of lipids in the blood. This is often due to diet and lifestyle factors. A prolonged increase of insulin levels can also lead to dyslipidemia.

Endocrinologist – a healthcare professional who treats people who have endocrine gland problems, such as diabetes.

Endogenous Estrogen - is estrogen produced by the body.

Euglycemia – also known as normoglycemia, simply refers to "normal" blood glucose levels, that is, not too high (hyperglycemia) or low (hypoglycemia).

Gestational Diabetes Mellitus (GDM) – a type of diabetes mellitus that develops only during pregnancy and usually disappears postpartum, but increases the risk that the mother will develop diabetes later. GDM is usually managed with meal planning, activity and, in some cases, insulin.

Glycemic index – a ranking of carbohydrate-containing foods, based on the food's effect on blood glucose compared with a standard reference food.

Hormone Therapy (HT) – the use of synthetic or natural female hormones to make up for the decline or lack of natural hormones produced in a woman's body. HT is sometimes referred to as estrogen replacement therapy (ERT) and previously known as hormone replacement therapy (HRT).

Hyperglycemia – a condition that occurs when one's blood glucose is higher than normal. Fasting hyperglycemia is blood glucose above a desirable level after a person has fasted for at least 8 hours. Postprandial hyperglycemia is blood glucose above a desirable level I-2 hours after a person has eaten.

Hypoglycemia – a condition that occurs when one's blood glucose is lower than normal, usually less than 70 mg/dL. Signs include hunger, nervousness, shakiness, perspiration, dizziness or lightheadedness, sleepiness and confusion. If left untreated, hypoglycemia may lead to unconsciousness. Hypoglycemia is treated by consuming a carbohydrate-rich food such as a glucose tablet or juice. It may also be treated with an injection of glucagon if the person is unconscious or unable to swallow. Hypoglycemia is also called an insulin reaction.

Hypertension – a condition present when blood flows through the blood vessels with a force greater than normal. Also called high blood pressure. Hypertension can strain the heart, damage blood vessels, and increase the risk of heart attack, stroke, kidney problems and death.

Insulin – a hormone that lowers the level of glucose in the blood. It is made by the beta cells of the pancreas and released into the blood when the glucose level increases, such as after eating. Individuals with diabetes do not make enough insulin or have a difficulty using insulin properly.

Insulin Pump – an insulin-delivering device about the size of a deck of cards that can be worn on a belt or kept in a pocket. An insulin pump connects to narrow, flexible plastic tubing that ends with a needle inserted just under the skin. Users set the pump to give a steady trickle or basal amount of insulin continuously throughout the day. Pumps release bolus doses of insulin (several units at a time)

at meals and at times when blood glucose is too high, based on programming done by the user.

Insulin Resistance - is a condition in which the body produces insulin but does not use it effectively.

Insulin Sensitivity - describes how sensitive the body is to the effects of insulin

Ketone – a chemical produced when there is a shortage of insulin in the blood, causing the body to break down body fat for energy. High levels of ketones can lead to diabetic ketoacidosis and coma. Sometimes referred to as ketone bodies.

Lipodystrophy - a disorder of adipose tissue characterized by a selective loss of fat.

Menopause – a normally occurring body process in women when estrogen and progesterone levels begin to decrease, causing the cessation of the menstrual cycle. A woman is considered to have reached menopause when she has not menstruated for 12 months or when the ovaries have been surgically removed.

Milligrams per deciliter (mg/dL) – a unit of measurement that represents the concentration of a substance in a specific amount of liquid. In the United States, blood glucose test results are reported as mg/dL.

Nephropathy - is damage to or disease of one or both kidneys.

Neuropathy – a disease of the nervous system. The three major forms in people with diabetes are peripheral neuropathy, autonomic neuropathy and mononeuropathy. The most common form is peripheral neuropathy, which affects mainly the legs and feet. Autonomic neuropathy affects the lungs, heart, stomach, intestines, bladder or genitals. Mononeuropathy affects a single nerve.

Obesity – a condition in which a greater than normal amount of fat is in the body. Obesity is defined as having a body mass index of 30 or more.

Retinopathy – an eye disease that is caused by damage to the small blood vessels in the retina. Loss of vision may result. The condition is also known as diabetic retinopathy.

Self-Monitoring of Blood Glucose (SMBG) – refers to an individual's self-blood glucose testing. Self-monitoring allows an individual to better understand how a treatment plan is successful and allows for changes in treatment to improve glycemic control.

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