

Sex matters: Unravelling the unique impact of diabetes on women's health

Nazli Parast and Jodi Heshka

There is a growing recognition that sex differences lead to variations in the way that diabetes manifests itself, and that the condition should be managed differently in women compared with men. This article explores some of the ways that women with diabetes are affected across their reproductive lives, such as by complications during pregnancy and risk of early menopause, and the elevated risks of a number of other complications, most notably including a range of cardiovascular diseases. It makes the case for developing a greater understanding of these sex-specific differences in order to provide tailored and effective treatment. Women with diabetes should collaborate with the healthcare professionals providing their care to develop personalised management plans that account for these sex-related differences.

In recent years, there has been a growing recognition that diabetes does not affect men and women equally. In women globally, diabetes is the ninth leading direct cause of death (Kapur et al, 2017), while cardiovascular disease is the most common (American Heart Association, 2023). This emerging field of research has sparked significant interest, as scientists delve into the potential differences in how diabetes manifests itself and is managed in women compared to men.

One key factor contributing to this disparity lies in the unique hormonal changes that women experience throughout their life span. As individuals vary in their response to diabetes, understanding these sex-specific differences becomes crucial in developing tailored and effective treatment approaches.

Here are some noteworthy facts that shed light on the distinctive relationship between diabetes and women's health:

1. Heightened risk following gestational diabetes. Women who develop diabetes during pregnancy face a considerably higher risk of developing

diabetes later in life. This phenomenon highlights the importance of closely monitoring and managing diabetes during and after pregnancy to mitigate long-term health consequences (Vounzoulaki et al, 2020).

2. Early menopause and type 2 diabetes. Research has revealed intriguing associations between early menopause or premature ovarian insufficiency and an increased risk of type 2 diabetes in women. These findings underscore the intricate interplay between hormonal changes and diabetes development (Anagnostis et al, 2019).

3. Escalating diabetes incidence in young women. Alarmingly, there has been a surge in the number of young women being diagnosed with diabetes and living with the condition. Unravelling the factors contributing to this trend is crucial in developing targeted prevention strategies and improving overall health outcomes (Thong et al, 2020).

4. Heightened risk of heart failure in women. Women with diabetes face a significantly higher risk of developing heart failure compared

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Article points

1. As the evidence grows that the consequences of diabetes are different between women and men, it is becoming clear that sex-specific considerations are paramount in managing diabetes effectively.
2. Women are at greater risk than men of developing a number of diabetes-related complications, notably a range of cardiovascular diseases.
3. Physiological changes across women's reproductive lives increase the risks to them and their babies, and make diabetes management more complicated.
4. It is essential that women with diabetes are involved in the planning of their care and the development of a comprehensive diabetes management plan.

Key words

- Complications of diabetes
- Personalised care
- Women's health

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“The greater risk of heart disease and other diabetes-related complications in women compared to men with diabetes increases the complexity of diabetes management.”

with their male counterparts with diabetes. Understanding the underlying mechanisms responsible for this difference can aid in devising interventions to protect women's cardiovascular health (Ohkuma et al, 2019).

5. **Diabetes and atrial fibrillation.** Diabetes remains a significant risk factor for the development of atrial fibrillation, an irregular heart rhythm. Notably, the link between diabetes and the occurrence of atrial fibrillation appears to be more pronounced in women than in men. This finding underscores the need to explore sex-specific factors that contribute to this association (Bohne, et al, 2019).

As researchers continue to delve into this captivating field, it becomes evident that sex-specific considerations are paramount in managing diabetes effectively. Recognising and addressing the unique challenges faced by women with diabetes can pave the way for targeted interventions, better health outcomes and an improved quality of life for millions of individuals worldwide. By exploring these sex-based differences, we move closer to a future where diabetes management is tailored to meet the specific needs of each patient, irrespective of sex.

Diabetes risk factors encompass a range of elements, such as family history, overweight/obesity, lack of exercise, age (being >45 years), belonging to certain ethnic groups and having metabolic syndrome (John Hopkins Medicine, 2023). However, it is crucial to recognise that women-specific risk factors also play a significant role in understanding diabetes in women. These include:

1. Weight gain from having a macrosomic baby during pregnancy (John Hopkins Medicine, 2023).
2. Polycystic ovarian syndrome (John Hopkins Medicine, 2023).
3. Physical inactivity, which is more prevalent in women than men (Garcia et al, 2016).
4. A stronger association between obesity and diabetes in perimenopausal women compared to postmenopausal women (Lee et al, 2021).
5. Early menopause and premature ovarian insufficiency are each associated with an increased risk of developing type 2 diabetes (Anagnostis et al, 2019).

It is important to emphasise the unique impact of cardiovascular disease on women with diabetes. They face a 58% higher risk of coronary heart disease and a 13% higher risk of all-cause mortality, compared with men with diabetes (Wang et al, 2019). Gestational diabetes not only increases a woman's lifetime risk of developing type 2 diabetes, but also independently elevates her risk of cardiovascular disease. Furthermore, despite men experiencing higher absolute rates of cardiovascular complications, women exhibit higher relative rates of cardiovascular issues linked to diabetes across all age groups in the contemporary era (Malmberg et al, 2020). The risk of developing heart failure is also notably higher in women with diabetes compared with their male counterparts (Ohkuma et al, 2019). As already mentioned, there is a stronger association between diabetes and incident atrial fibrillation among women than men.

Diabetes substantially increases the risk of stroke in women. Those with type 1 diabetes have a 4-fold higher risk and those with type 2 diabetes an almost 2-fold higher risk of total stroke than women without diabetes (Regensteiner et al, 2015). The increased mortality rates due to cardiovascular disease stem from multiple factors, including a greater burden of risk factors, heightened involvement of inflammatory elements, smaller coronary artery sizes and, frequently, less aggressive diabetes treatment in women (Maas and Appelman, 2010). Moreover, higher intake of diet drinks or artificially sweetened beverages has been associated with an increased risk of stroke (particularly the small artery occlusion subtype), coronary heart disease and all-cause mortality in post-menopausal women (Mossavar-Rahmani et al, 2019).

Managing diabetes presents unique challenges for women. The greater risk of heart disease and other diabetes-related complications in women compared to men with diabetes increases the complexity of diabetes management (Centers for Disease Control and Prevention, 2022). Women face a higher risk of developing yeast and urinary tract infections. Fluctuating hormone levels across the menstrual cycle can lead to unpredictability in glycaemic management. Diabetes increases the risk of complications during and after pregnancy, making careful monitoring essential. About 50% of women with gestational diabetes go on to develop type 2

diabetes. During perimenopause and menopause, owing to the reduction in oestrogen levels, fluctuations in glucose levels become unpredictable (Centers for Disease Control and Prevention, 2022).

More women-specific research with a focus on diabetes needs to be conducted to find out if women need different dose titration for antidiabetes drugs, depending on their age and hormonal status. It is important to discuss actions that can be taken to manage diabetes effectively. It is of utmost importance for the individual living with diabetes to collaborate with diabetes educator, physician or nurse practitioner, and diabetes specialist to develop a comprehensive diabetes management plan. Openly discussing health targets is an important factor in planning, as each individual's experience with diabetes is unique, so finding a personalised approach that suits their needs is key to achieving optimal well-being.

By shedding light on the sex-specific aspects of diabetes, we hope to contribute to improved healthcare strategies and better outcomes for women living with this condition. Understanding and addressing these differences is pivotal in achieving personalised and effective diabetes management for all. ■

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