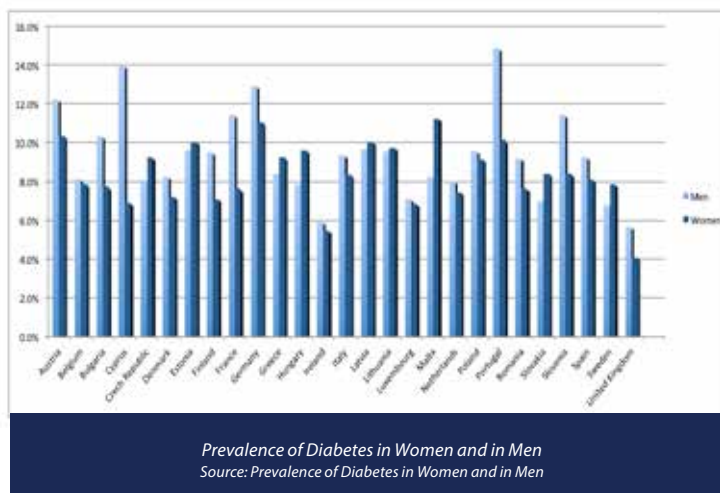


Diabetes: The Basics

Diabetes is a complex metabolic disease which results from an inability to process or produce insulin.¹ The pancreas is responsible for producing insulin, a hormone which regulates blood glucose (sugar) levels. Some common symptoms of diabetes are increased thirst and/or hunger, frequent urination, and fatigue² but if left untreated it can lead to complications such as stroke, heart attack,³ kidney failure,⁴ vision impairment⁵ and nerve damage.⁶ In 2014, 422 million adults or 8.5% of the adult population were estimated to be living with diabetes, a proportion which has almost doubled since 1980.⁷ Globally, the disease ranks as the sixth leading cause of death.⁸ Diabetes can take multiple forms. Type 1 diabetes occurs when the pancreas does not produce enough insulin. Formerly called

juvenile-onset diabetes, the disease can affect people of all ages but more commonly presents in children or young adults.⁹ Currently, what causes type 1 diabetes and how to prevent it are unknown. Type 2 diabetes accounts for approximately 90% of all cases of diabetes globally.^{10,11} It occurs when the body does not use the insulin being produced by the pancreas effectively (insulin resistance). It usually results from excessive body weight and physical inactivity. Gestational diabetes occurs in women during pregnancy, usually presenting later in the pregnancy.¹² It often goes away after delivery though women who have experienced it are at greater risk of developing type 2 diabetes in future¹³. This chronic condition is usually managed with a combination of lifestyle changes to diet and level of exercise, as well as medication administered orally or subcutaneously. Other interventions may sometimes be required.



Diabetes risk factors

There are various risk factors that studies have found are associated with developing diabetes including the following:^{14,15,16,17}

- Physical inactivity
- Being overweight or obese
- Family history of diabetes
- High blood pressure
- Previously having suffered a heart attack or stroke
- Age (risk of developing diabetes increases with age)
- Race (being of South Asian, Black African, or Afro-Caribbean descent increases the likelihood of developing type 2 diabetes)
- Suffering from prediabetes
- Previously developing gestational diabetes
- Having polycystic ovary syndrome

Diabetes, sex and age

For both men and women, the proportion of people with diabetes increases with age.¹⁸ However, incidence rates of type 1 diabetes among children (those under fifteen years-of-age) are increasing and are projected to rise in the future.^{19,20} Incidence of type 2 diabetes is also rising among children, with the growth largely due to increasing levels of childhood obesity.^{21,22}

Globally, men are more likely to suffer from diabetes than women²³ though the disease is still the tenth leading cause of death for women in high-income countries²⁴ and there is evidence that women live with diabetes less effectively than men.²⁵ In 2015, 9.1% of the population of the European Union were estimated to be suffering from diabetes.²⁶ Fig. 1 above presents the prevalence of diabetes across EU Member States by sex²⁷. In some Member States prevalence of the disease is higher among women (e.g. Czech Republic, Greece, Hungary, Malta), while in others the sex gap is very small (e.g. Belgium, Ireland, Lithuania, Luxembourg). Existing sex gaps may narrow in the future as women lead more sedentary lifestyles and experience

increasing rates of obesity²⁸ which puts them at greater risk of developing type 2 diabetes.^{29,30}

Sex-specific differences in diabetes: the influence of hormones

Treatment of women of reproductive age who develop diabetes can represent a particular challenge.³¹ Fluctuations in hormone levels occur through the menstrual cycle. These fluctuations can affect blood sugar control in some women,³² reducing it after ovulation takes place.³³ Effective treatment of diabetes for women experiencing such fluctuations as a result of their menstrual cycle requires close monitoring of their blood sugar levels and may necessitate adjustments in doses of any prescribed medication.

As many as one in five women of reproductive age suffer from polycystic ovary syndrome (PCOS), a hormonal disorder present in women with elevated levels of male hormones such as testosterone.³⁴ Women who suffer from this disorder can exhibit long or irregular menstrual cycles which have been found to carry an elevated risk of developing type 2 diabetes.³⁵ The insulin resistance of between 50 to 70% of women with PCOS is estimated to be elevated or reduced, indicating an elevated risk of developing diabetes.^{36,37} The odds of women with PCOS developing type 2 diabetes is approximately four times that of women without PCOS³⁸. For women who suffer from obesity as well as PCOS, the risk of developing type 2 diabetes can be as much as five times that of non-obese PCOS sufferers³⁹. Women with PCOS are also at a higher risk of developing gestational diabetes^{40,41} (gestational diabetes is discussed in the next section).

For women with diabetes, undergoing the menopause can represent a particular challenge when managing that disease. Changes in the levels of oestrogen and progesterone can lead to fluctuations in blood glucose levels as well as weight gain, both of which can make it necessary to increase any medication being taken to manage the disease.⁴² In addition, the combination of diabetes and menopause can lead to sleep problems as well as leaving women at greater risk of developing vaginal and urinary tract infections.⁴³ Early menopause (which takes place in women under the age of 45) is associated with increased risk of type 2 diabetes, though more research is necessary to clarify the nature of this relationship.^{44,45} Existing research on the impact of hormone replacement therapy (HRT) as treatment for the menopause indicates that it decreases insulin resistance in women^{46,47}, though further research is needed before conclusions can be drawn about the impact of HRT on women with diabetes.⁴⁸

Diabetes and pregnancy

Managing diabetes during pregnancy represents a particular challenge. It is difficult to control the blood glucose levels of expectant mothers suffering from either type 1 or 2 diabetes and this can have an impact on both the mother and the foetus. It is recommended that diabetics who are planning to become pregnant meet with their doctor in order to make a plan for pregnancy.⁴⁹ Doctors recommend that women try to bring their blood glucose levels close to their target range prior to becoming pregnant and may recommend that women who are overweight lose some weight as part of this plan to bring blood glucose levels under control.⁵⁰ Where a pregnancy is unplanned it is important for women who are diabetic to consult their doctor as soon as possible.

Pregnant women suffering from diabetes should maintain close contact with their doctor over the course of the pregnancy. Blood glucose levels will need to be monitored much more frequently and it may be necessary to make adjustments to any medication that is habitually taken to manage the disease.⁵¹

Women with type 1 or type 2 diabetes who have uncontrolled or undiagnosed diabetes during pregnancy are at increased risk of complications which can affect the health of the mother and the foetus. Where diabetes is not well controlled, women are at risk of premature birth, miscarriage or stillbirth,⁵² while babies are at greater risk of developing serious birth defects, in particular those affecting the heart, brain or spine.⁵³ It is during the early months of the pregnancy when the organs of the foetus are being formed that these birth defects can develop where blood sugar is uncontrolled. Where pregnancy is unplanned this often occurs before the woman knows she is pregnant. Uncontrolled diabetes may also lead to the foetus growing excessively large, which can cause discomfort for the mother towards the end of the pregnancy. This can also lead to issues during delivery, making delivery by caesarean section more likely⁵⁴. Women with pre-existing diabetes are more likely to have high blood pressure and are therefore at greater risk of preeclampsia which can lead to stroke or seizure in expectant mothers.

Gestational diabetes

Gestational diabetes mellitus (GDM) is a form of diabetes that occurs during pregnancy, usually developing during the second half of the pregnancy.⁵⁵ It is estimated to occur in 3.8 to 7.8% of pregnancies in Europe.⁵⁶ While the exact number of women who suffer with GDM over the course of their pregnancy is unknown, its prevalence appears to be increasing.⁵⁷ Women in Southern Mediterranean countries appear to be at greater risk of developing GDM than they are in Northern EU countries. There is no consensus across EU Member States on testing, diagnostic procedures, and screening⁵⁸ so policy tackling GDM varies accordingly across states.

The complications that GDM can lead to for women and their foetuses are described in the section above. However, in addition to those, women and their infants have a greater risk of developing type 2 diabetes in the future. As much as half

of all women who experienced GDM during their pregnancy will develop type 2 diabetes within 5 years of the birth,⁵⁹ with obesity representing an added risk factor in the emergence of this disease.⁶⁰

Children born to women who suffered from GDM over the course of their pregnancy are six times more likely to develop type 2 diabetes than children born to mothers who did not develop GDM⁶¹. Children born to women with diabetes are also more to develop childhood obesity.⁶²

Diabetes and other diseases

Diabetes and cardiovascular disease

Diabetes is strongly associated with several other diseases. Diabetes is now seen as the biggest single risk factor for heart disease.⁶³ High blood glucose levels which result from diabetes can lead over time to damage of blood vessels;⁶⁴ damage which can be exacerbated in individuals with other risk factors such as high blood pressure, high cholesterol, and smoking. Those suffering from diabetes are approximately twice as likely to develop a range of cardiovascular diseases (CVD) as non-sufferers.⁶⁵ Those whose diabetes is undiagnosed or poorly controlled are most at risk of heart attack or stroke. The link between cardiovascular disease and diabetes is even stronger for women. The risk of women dying from coronary heart disease associated with type 2 diabetes is 50% greater than for men.⁶⁶ Disparities in treatment that favour men may partially explain this higher coronary risk among diabetic women.

Diabetes and cancer

Both type 1 and type 2 diabetes are also linked to increased rates of certain types of cancers (e.g. liver, pancreatic, colorectal)⁶⁷ for both men and women. Diabetic women see a substantial increase in their risk of developing endometrial and breast cancer.^{68,69} Post-menopausal women with type 2 diabetes (but not type 1) see their risk of developing breast cancer rise by 27% on average compared with women without type 2 diabetes.⁷⁰ Diabetes can also affect cancer therapy and the use of screening in sufferers of breast cancer.⁷¹ Diabetic women with breast cancer have a greater risk of death than their non-diabetic counterparts.⁷²

Diabetes and depression

Having diabetes roughly doubles the odds of having depression compared with the general population.⁷³ In Western countries, depression is approximately twice as prevalent among women as men.⁷⁴ This gender gap is replicated at EU-level, though the size of the gap varies across countries.⁷⁵ Rates of depression among women with diabetes are almost twice that of men.⁷⁶ Depression affects quality of life, reduces the ability to self-manage diabetes⁷⁷ and increases the risk of complications, heart disease, and premature mortality.⁷⁸ The underlying mechanisms for the increased mortality risk associated with depression are not well understood and need to be studied further. Increased awareness of depression in women with diabetes by health professionals may lead to better management of both conditions and improve outcomes.

Diabetes and dementia

Individuals with type 2 diabetes have a risk of developing dementia (a range of symptoms associated with a decline in thinking skills and memory⁷⁹) that is as much as 60% greater than those without dementia.⁸⁰ Among diabetics, women are more at risk than for men of vascular dementia (but not non-vascular dementia).⁸¹ Further research is required to understand which this gap emerges between men and women.

Diabetes and osteoporosis

Women are generally more likely than men to suffer from osteoporosis (a disease that causes weakness in the bones) than men in part due to the reduction in oestrogen, a hormone which protects bones, which occurs during the menopause.⁸² Increasingly, there is evidence that osteoporosis and diabetes are related;⁸³ individuals with type 1 diabetes have reduced bone mass and an increased risk of fragility fractures compared to those without it. Those with diabetes type 2 are particularly susceptible to low trauma fractures, especially hip fractures.⁸⁴ Women with diabetes should therefore pay special attention to their bone health, already an important health consideration for older women.

Social factors and diabetes

Social factors (such as low educational level, income and occupation) are related to risk of obesity, an important risk factor for type 2 diabetes which accounts for the vast majority of cases of diabetes globally. This relationship appears to be stronger for women than it is for men.⁸⁵ Physical inactivity, high levels of consumption of sugar-sweetened beverages, moderate alcohol consumption, and smoking have all been found to be associated with increased risk of diabetes.⁸⁶ Globally, women are estimated to smoke five times less than men,⁸⁷ however there is evidence that the gender-gap in alcohol consumption is closing, particularly among younger cohorts.⁸⁸ Women in the European Union are less active than men, and have higher rates of obesity.⁸⁹

European and national strategies for diabetes prevention

Given the importance of obesity and physical activity as predictors of diabetes, policy in Europe aiming to tackle the disease focuses on these predictors. The WHO's *Action Plan for implementation of the European Strategy for the Prevention and Control of Noncommunicable Diseases 2012–2016* focused on making diets healthier and increasing physical activity.⁹⁰

The European Union set up the European Diabetes Indicator Project (EUDIP) to gather information consistently about risk factors for diabetes across Member States with the aim of promoting “good diabetes health status and care in the different countries”⁹¹. The EU’s *Diabetes in Europe - Prevention using Lifestyle, Physical Activity and Nutritional Intervention* project aims to implement a programme targeting lifestyle changes that will prevent type 2 diabetes from emerging in high-risk individuals.⁹² At a national level, some Member States have introduced or will soon introduce sugar or fat taxes.⁹³ Policymakers hope that by targeting risk factors for obesity, they can reduce the prevalence of diseases like diabetes and tackle the associated costs of treating diabetes to their national health care systems which can range between 7.4 and 11.5% of total health expenditure.⁹⁴

In addition, the European Commission has called for increased cooperation to tackle prevention and care of chronic diseases within the European Union, and in response the European Joint Action on Chronic Diseases and Promoting Healthy Ageing across the Life Cycle (JA-CHRODIS) was launched in 2014. The aim is to use existing data to discern best practices across countries in combating a range of chronic diseases, as well as to encourage coordination and cooperation among Member States. Diabetes was chosen as a case study, and JA-CHRODIS undertook the mapping of national diabetes plans (NDPs) in Europe.⁹⁵

Not all the countries included in the study are making strong progress with their NDPs; countries like Ireland and France do not have an NDP for example, and they are also lagging behind their European neighbours with respect to the preventative measures they are using and the extent to which they are raising awareness about the disease.⁹⁶ Of the 13 (of 22) countries included in the case study, most of the NDPs had a general focus on the disease which covered types 1 and 2 diabetes, as well as gestational diabetes.

The report highlights the fact that most NDPs are developed by ministries of health, and that a lack of resources, skills, and influence can prevent these bodies from persuading key stakeholders (e.g. patients’ organisations, insurance companies) of the necessity of their involvement in developing an NDP.

Tackling climbing rates of diabetes in the European Union requires Member States to develop integrated plans that include stakeholders from across different sectors, put forward measures targeting individual-level as well as environmental risk factors, and, crucially, borrow from models of good practice in neighbouring states. The European Union has an important coordination role to play to ensure that Member States have the information and support that is necessary for developing

strategies targeting chronic diseases available to them.

Steps for Policy Action

- 1. Improve existing EU data collection on diabetes. Data should also be collected not only on death rates but also on the incidence and prevalence of diabetes, as well as its complications, disaggregating the data by gender and age in order to understand diabetes trends more fully.**

Examine the interaction between diabetes, gender, age, and other chronic diseases. As individuals live longer and the prevalence of chronic diseases increases, it is important to understand the role that gender, age, and the interaction with other chronic conditions that lead to multi-morbidity and an increase in the chronic disease burden. This would lead to better prevention and management of diabetes and other chronic diseases.

- 2. Further study the impact of diabetes on other diseases affecting women in the Chronic Disease Joint Action. Diabetes in women has been linked to an increased risk of a range of diseases including cardiovascular disease, certain cancers, depression, and osteoporosis. The connection between diabetes and other conditions needs to be examined in more depth to gain a greater understanding of how diabetes impacts women's health across the lifespan. Additionally, medical doctors need to be trained to recognise and manage the complex interaction of chronic diseases.**

Increase awareness of the connection between pregnancy and diabetes and improve detection and treatment of gestational diabetes. Women with pre-existing diabetes should be better informed about the risks of diabetes and pregnancy in order to help them prepare for and manage their condition better during pregnancy and thereby ensure good health for both mother and child. Gestational diabetes mellitus (GDM) increases the risk of type 2 diabetes in both mother and child. Efforts should be made to increase awareness and prevent the development of GDM. EU-wide screening and diagnostic guidelines need to be developed to improve better detection and treatment as well as the training of health professionals.

- 3. Examine the effect of social determinants on diabetes for both women and men across the lifespan. Diabetes disproportionately affects lower socio-economic groups and older populations with women experiencing a greater disadvantage. In order to tackle health inequalities, it is essential for policymakers and healthcare professionals to understand the interplay between social, ageing and gender determinants to improve diabetes prevention and management across the lifespan and reduce the burden of chronic diseases.**

Continue to put forward policy tackling Europe's obesity crisis. Targeting women in particular due to their role as family caregivers to ensure that they are health-literate and understand the role of diet and exercise in preventing diabetes. Type 2 diabetes is largely preventable. About nine out of ten cases could be avoided by taking a few simple steps: keeping weight down, exercising more, eating a healthy diet and not smoking.

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