What is Diabetic Nephropathy?

Diabetes can affect various organs. One complication is diabetic nephropathy (diabetic kidney disease). This is a kidney condition that occurs only in people with diabetes mellitus and results in progressive damage to the small filtering units of the kidney (glomeruli). This leads to protein loss in the urine, high blood pressure and declining kidney function.

In Australia, about 35% of people who need dialysis (artificial kidney treatment) or kidney transplantation have diabetic nephropathy. Not only can diabetic nephropathy lead to progressive deterioration in kidney function, it is also a strong risk factor for heart disease and strokes.

As the number of people diagnosed with Type 2 diabetes mellitus is rapidly increasing in Australia, the number of people with chronic kidney disease and diabetic nephropathy is also increasing. Early and ongoing testing of kidney function and protein in the urine is extremely important. Tight control of blood glucose (blood sugar) levels and blood pressure at all stages of diabetes management aims to prevent or delay the development of diabetic nephropathy and chronic kidney disease.

Who Gets Diabetic Nephropathy?

Diabetic nephropathy is a long-term complication of diabetes but only 20-30% of people with diabetes develop diabetic nephropathy. It is not entirely understood why some patients develop diabetic nephropathy and some don’t. There are several factors that can increase the risk of diabetic nephropathy. These include:

- Having chronically elevated blood sugar levels
- High blood pressure
- Smoking
- Being overweight
- Having diabetes related eye problems (diabetic retinopathy) and nerve damage (diabetic neuropathy)
It is important to realise that these are only risk factors. It is possible to have no risk factors and still develop kidney problems. Conversely, there are some people with all the risk factors who do not develop kidney problems.

Symptoms of Diabetic Nephropathy

In the majority of cases, diabetic nephropathy causes no symptoms and does not affect the amount of urine you are passing. Only if it progresses to advanced kidney failure, patients may experience fatigue, loss of appetite, nausea and symptoms of fluid overload such as breathlessness and leg swelling. Your doctor will perform urine and blood tests to detect diabetic nephropathy.

The Course of Diabetic Nephropathy

There are two types of diabetes:

**Type 1 diabetes** is most frequently seen in younger people and requires insulin treatment immediately

**Type 2 diabetes** is usually seen in older people and is often treated initially with diet, exercise and weight loss (when appropriate) and medications.

When the kidneys are working normally, they prevent protein leaking from the blood into the urine. In diabetic nephropathy, the filters of the kidneys (glomeruli) become damaged, resulting in protein leakage. So finding protein in the urine can be the first sign of kidney damage or diabetic nephropathy.

Urine tests are therefore part of the routine checks offered to people with diabetes. Urine tests can detect and measure how much albumin (a type of protein) is present in the urine.

**Microalbuminuria:** the amount of albumin that leaks into the urine is between 30 and 300 mg per day. It is usually the first sign that diabetic nephropathy has developed. Over months or years, microalbuminuria may go away (especially if treated), persist at about the same level, or progress to proteinuria. Microalbuminuria, even
if only traces of albumin in the urine, is a risk factor for heart disease and stroke.

**Proteinuria:** the amount of albumin that leaks into the urine is more than 300 mg per day and is irreversible. Proteinuria usually marks the beginning of a gradual decline in kidney function, which can even progress to end stage kidney failure at some time in the future. It is sometimes called macroalbuminuria or overt nephropathy.

The course of diabetic nephropathy is a little different depending on the type of diabetes.

**In Type 1 diabetes,** the course is more consistent because the time of onset is known. After 5-20 years of living with Type 1 diabetes, a proportion of people will begin to pass excess protein in the urine. Initially, this can only be detected by measuring a protein called albumin, in the urine (microalbuminuria). Gradually (usually over years) the amount of protein in the urine (proteinuria) increases and kidney function eventually declines. As the amount of protein excreted in the urine increases, fluid retention develops. High blood pressure is almost always present at this stage. Over a period of time, the declining kidney function can result in kidney failure.

**In Type 2 diabetes,** the course of diabetic nephropathy is not so well established because the date of onset of Type 2 diabetes is often not known. People may have mild Type 2 diabetes for years before it is detected and treated.

Unfortunately, when diabetic kidney disease develops, other diabetic complications can occur simultaneously affecting the:

1. eyes (diabetic retinopathy)
2. nerves (diabetic neuropathy)
3. blood vessels (diabetic atherosclerosis), which can lead to heart disease, stroke and non-healing wounds and ulcers on the legs
How is Diabetic Nephropathy Diagnosed?

As it is not known which people with diabetes will develop kidney disease, it is important that testing for the earliest signs of kidney disease takes place regularly. Treatment which may slow the progression of the disease can then be started.

When someone with diabetes develops microalbuminuria, it is usually due to diabetic nephropathy. A kidney biopsy may be required in a small number of cases. This procedure involves inserting a needle into the kidney (under local anaesthesia) and taking a small sample of kidney tissue.

Prevention and Treatment of Diabetic Nephropathy

Blood Glucose

There is now good evidence that tight control of blood glucose (blood sugar) levels will delay and possibly prevent the development of kidney disease (and other complications) in people with diabetes. Your doctor can check the HbA1c level, a blood test that gives information about the average blood sugar control over the last 3 months.

Blood Pressure

Early detection and treatment of high blood pressure will also slow down the rate of kidney damage in people with diabetes, who already have diabetic kidney disease. Regular monitoring and good control of blood pressure are absolutely essential, aiming for blood pressure consistently less than 125/80mmHg.
Once kidney function starts to decline, control of blood pressure has been found to be the single most important factor in slowing the rate of decline. Some blood pressure lowering drugs, such as ACEi (angiotensin converting enzyme inhibitors) and ARB (angiotensin receptor blockers), have been shown to decrease proteinuria and slow the progression of kidney disease in diabetic nephropathy. A diet low in salt will also help to optimise the blood pressure.

Cholesterol or Fats in the Blood
Control of high blood fats (cholesterol and triglycerides) will help prevent disease of blood vessels and may also help slow the rate of decline of kidney function. In addition to reducing the intake of fats in the diet, medication to lower blood cholesterol levels may also be prescribed. These medications may also help to lower the risk of developing heart disease, peripheral vascular disease and stroke.

Restricted Protein Diet
It remains uncertain whether dietary protein restriction slows the long-term decline in kidney function in diabetic nephropathy. Some research has shown that dietary protein restriction may protect against the progression of diabetic kidney disease. This effect is separate from the effects of blood pressure control and blood glucose levels. Moderate restriction should be supervised by a dietitian, associated with a diabetes clinic or renal unit to ensure the correct balance of carbohydrate, fat and protein is maintained in the diet.

Quit Smoking
It is well known that smoking is related to the development of atherosclerosis (disease of blood vessels). Smoking also contributes to the development of microalbuminuria in diabetic nephropathy. It is therefore important that all diabetic patients stop smoking.

All the above measures will help to control diabetic nephropathy and to prevent the other complications of diabetes.
What Happens if My Kidneys Fail?

If as a result of diabetic nephropathy, kidney function is lost, treatment in the form of dialysis or kidney transplantation is available. Dialysis (haemodialysis or peritoneal dialysis) is very effective in helping people to lead healthy and active lives and can often be managed at home. Kidney transplantation is possible for many people. Some people, with Type 1 diabetes, may be suitable for a combined kidney and pancreas transplant.

Information about haemodialysis, peritoneal dialysis, transplantation and related health and lifestyle issues is available from the Renal Resource Centre and Kidney Health Australia.

Any information provided does not constitute medical advice and is intended for information only. Consult a healthcare professional for specific treatment recommendations.
Diabetes and Your Kidneys

The Renal Resource Centre provides information and educational materials on kidney disease, dialysis and transplantation for patients and health professionals.

The primary objective of the Centre is to ensure that patients have easy access to such information, are well informed and can actively participate in their own health care. The Renal Resource Centre is committed to providing education and service to the renal community.

Publications of the Renal Resource Centre are endorsed by The Australian and New Zealand Society of Nephrology

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