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## Diabetes and kidney failure

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### Summary

- One of the causes of kidney failure is diabetes mellitus, a condition characterised by high blood glucose (sugar) levels.
  - Over time, the high levels of sugar in the blood damage the millions of tiny filtering units within each kidney.
  - There is no cure, and treatment must become ever more aggressive as the kidneys deteriorate towards failure.
  - Treatment options include medications, dialysis and kidney transplant.
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The main job of the kidneys is to remove waste from the blood and return the cleaned blood back to the body. Kidney failure means the kidneys are no longer able to remove waste and maintain the level of fluid and salts that the body needs.

One cause of kidney failure is diabetes mellitus, a condition characterised by high blood glucose (sugar) levels. Over time, the high levels of sugar in the blood damage the millions of tiny filtering units within each kidney. This eventually leads to kidney failure.

Around 20 to 30 per cent of people with diabetes develop kidney disease (diabetic nephropathy), although not all of these will progress to kidney failure. A person with diabetes is susceptible to nephropathy whether they use insulin or not. The risk is related to the length of time the person has diabetes.

There is no cure for diabetic nephropathy, and treatment is lifelong. Another name for the condition is diabetic glomerulosclerosis. People with diabetes are also at risk of other kidney problems, including narrowing of the arteries to the kidneys, called renal artery stenosis or renovascular disease.

### Symptoms of kidney failure

For people with diabetes, kidney problems are usually picked up during a check-up by their doctor. Occasionally, a person can have type 2 diabetes without knowing it. This means their unchecked high blood sugar levels may be slowly damaging their kidneys. At first, the only sign is high protein levels in the urine, but this has no symptoms. It may be years before the kidneys are damaged severely enough to cause symptoms. Some of the symptoms may include:

- Fluid retention (oedema of the legs or face)
- Fatigue
- Headache
- Nausea
- Vomiting.

### Kidneys explained

The human body has two kidneys, one on either side of the spine beneath the lower ribs. Inside each kidney are about one million tiny units called nephrons. Each nephron consists of a small filter (glomerulus) attached to a tubule. Water that contains waste is separated from the blood by the filters and directed into the tubules. Much of the water is returned to the blood by the tubules, while the wastes are concentrated into urine. The urine is collected from the tubules by a funnel-like structure (renal pelvis). From there, the urine flows down a tube (ureter) that joins each kidney to the bladder.

Urine leaves the bladder via the urethra, the thin tube that connects to the outside of the body. Kidneys affected by diabetic nephropathy no longer work efficiently, and trace amounts of protein appear in the urine

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(microalbuminuria). The retained water and salts cause the characteristic fluid retention and, frequently, the blood pressure begins to rise.

### **The mechanism is unknown**

It is clear that diabetes can lead to kidney disease, but just why high blood sugars should damage the glomeruli is unclear. High blood pressure (hypertension) is a known risk factor for kidney disease and people with diabetes are prone to hypertension. The renin-angiotensin system – which helps regulate blood pressure – is also thought to be involved in the development of diabetic nephropathy.

Other risk factors include cigarette smoking and family history. Diabetic nephropathy progresses steadily despite medical intervention. However, treatment can significantly slow the rate of damage.

### **Diagnosis methods**

Diabetic nephropathy is diagnosed using a number of tests including:

- **Urine tests** - to check protein levels. An abnormally high level of protein in the urine is one of the first signs of diabetic nephropathy.
- **Blood pressure** - regular checks for raised blood pressure are necessary. Elevated blood pressure is caused by diabetic nephropathy and also contributes to its progression.
- **Blood tests** - to check the degree of kidney function.
- **Biopsy** - a small tag of tissue is removed from the kidney, via a slender needle, and examined in a laboratory. This is usually only performed when there is doubt about whether kidney damage is due to diabetes or to another cause.
- **Kidney ultrasound** - enables the size of the kidneys to be imaged and allows the arteries to the kidneys to be checked for narrowing that can cause decreased kidney function.

### **Treatment options**

There is no cure for diabetic nephropathy. Treatment must become ever more aggressive as the kidneys deteriorate towards failure. Medical options include:

- **Prevention** - this is the best form of treatment and includes good control of blood glucose levels and blood pressure.
- **Medications** - including medications to reduce high blood pressure, particularly angiotensin converting enzyme (ACE) inhibitors and angiotensin receptor blockers to curb kidney damage.
- **Dialysis** - or artificial kidney treatment. End stage kidney failure is the failure of the kidney to function at all. Dialysis involves either shunting the patient's blood through a special machine (haemodialysis) that helps remove the wastes while preserving water and salts, or removing wastes through fluid introduced into the abdomen (peritoneal dialysis). Dialysis is required several times every week for the rest of the person's life.
- **Kidney transplant** - a healthy donor kidney, obtained either from someone who has died or from a relative or friend, replaces the function of the diseased kidneys.

### **Risk reduction strategies**

A person with diabetes can reduce their risk of diabetic nephropathy, or at least delay its onset, in a number of ways including:

- Strictly controlling blood sugar levels
- Making sure that blood pressure is well controlled
- Avoiding non-steroidal anti-inflammatory drugs (NSAIDS)
- Treating urinary tract infections promptly with antibiotics
- Drinking plenty of non-alcoholic fluids, preferably water
- Avoiding medical treatments that stress the kidneys, such as x-rays requiring the injection of contrast dyes
- Having regular tests to ensure the health of your kidneys.

### **Where to get help**

- Your doctor

- Juvenile Diabetes Research Foundation Australia Tel. (03) 9696 3866
- Diabetes Australia Victoria Tel. 13 RISK (13 7475)
- Kidney Health Australia Tel. (03) 9866 3300
- Kidney Health Australia Information Line Tel. 1800 4 KIDNEY (543 639), TTY 1800 555 677

**This page has been produced in consultation with and approved by:**

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