



Produced by Dr. David Voss, Specialist Renal Physician  
in the interest of public health education.  
[www.kidney.net.nz](http://www.kidney.net.nz)

## Diabetes mellitus and the kidney Information Sheet

### What is diabetes mellitus?

Diabetes mellitus (often referred to just as diabetes) is a lack of insulin. As a result of the lack of insulin, glucose is not handled properly in the human body, and high blood sugar (glucose) levels result. The high blood sugar and / or some of its products are thought to cause most of the damage to the body.

The small blood vessels, affecting the eyes, heart, kidneys and nerves are particularly vulnerable. Over many years the blood vessels walls become damaged, and bleed, or become narrowed and may clog up, leading to a loss of blood supply to the area that blood vessel supplies.

### How is diabetes treated?

Diet changes, weight reduction in over weight people, and increased physical exercise are all important life-style changes to improve the control of diabetes mellitus.

Some people with diabetes can, in the early stages, manage their diabetes with these life-style changes, but most require medications - either tablets or insulin. Insulin is always given by injection.

Regular testing of blood sugar levels at home and visits to the doctor and nurse for on-going monitoring are also essential.

### How does diabetes mellitus affect the kidneys?

The kidney acts as a filter of the blood, removing the wastes from the blood. Over years of high blood sugar levels, damage occurs to the fine blood vessel walls in the kidney filters, and these filters become leaky. The earliest sign of diabetic damage to kidneys is protein in the urine.

A urine and blood test is performed to check for this. The presence of microalbuminuria, or an albumin : creatinine ratio greater than 2.5 in a diabetic is suggestive of diabetic kidney damage (diabetic nephropathy).

Further damage to the fine filters in the kidney can lead to blood leaking into the urine. Usually only a small amount of blood leaks, too small amount to see with the eye, and requires laboratory testing, or looking at a urine sample under a microscope.

This information sheet is produced as introductory information on diabetes mellitus for the consumption of the general public seeking further information; and families of and patients suffering from diabetes mellitus in the interest of general education. This information sheet is not a replacement for good medical advice and care. This information should be used as an adjunct to any reputable therapy and information from your health professional. The information herein is written expressly for consumption within the practice of medicine and nephrology within New Zealand. Whilst much of its content may be applicable to the practice of nephrology in other countries or situations, it should be read with this limitation in mind.



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About 4 in every ten people with type 1 diabetes mellitus (on insulin), and approximately 2 in every ten with type 2 diabetes mellitus (on tablets and / or insulin) will develop these kidney problems.

Prolonged on-going damage to the kidneys leads to deposits of material in the kidney, and over several years the filters scar up, and no longer function. The kidneys cannot grow more or new filters. As more and more filters scar up, the kidney fails to adequately clean the blood of the waste products. The build up of these waste products leads to the symptoms of kidney disease.

Not everyone with diabetes mellitus and protein in the urine will progress to more serious kidney damage. We do not know what causes some people with diabetes mellitus to progress to more serious kidney damage. Maori and Pacific Islander populations are four to five times more likely to get serious kidney damage from diabetes mellitus.

### How do I know diabetes mellitus is affecting my kidneys?

There are no early warning symptoms. Symptoms usually do not develop until quite late.

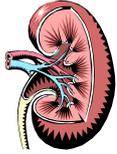
It is important to be suspicious of the kidneys being involved in people with diabetes mellitus. Blood tests for control of diabetes ( $HbA_{1c}$ ), and regular urine tests looking for protein in the urine, and kidney function blood tests (urea and creatinine), and regular blood pressure checks are paramount.

### What can be done to prevent diabetes mellitus damaging the kidneys?

Evidence now shows that the good control of diabetes mellitus, and good control of blood pressure, and the use of a special blood pressure lowering medications (ACE inhibitors and ARBs) all are important in preventing, and delaying further damage, to the kidneys from diabetic nephropathy.

Monitoring of blood sugar levels at home is important. Regular assessment of sugar control with a blood test for glycosylated haemoglobin ( $HbA_{1c}$ ) is helpful information also.

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Good blood pressure control, with the systolic (bigger number) about 130 - 140mmHg; and the diastolic (lower number) less than 80mmHg, and preferably lower, is essential to protect the kidneys.

The best medications for blood pressure control in diabetes mellitus are ACE (angiotensin converting enzyme inhibitors) inhibitors or ARBs (angiotensin II receptor blockers). There is probably no difference in the benefits to the kidneys between these two groups of medications.

Examples of ACEIs: captopril, cilazapril, enalapril, lisinopril, perindopril, quinapril, Ramapril, trandolopril. Examples of ARBs: candesartan, losartan. These ARBs are not readily available in New Zealand. Either side-effects from a trial of ACEIs, a contra-indication to the use of ACEIs, or failure to achieve adequate blood pressure control with other blood pressure medications must occur before ARBs can be available "free" on a doctor's prescription.

*Good control of blood pressure,  
ACEI or ARBs for blood pressure control, and  
good blood sugar control are important to prevent the onset, and  
delay the progression of established diabetic kidney damage.*

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