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# Kidneys and Diabetes

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## Introduction

Here are some facts about kidneys and diabetes:

- Diabetes is the single most common cause of end-stage renal disease [ESRD] in Europe and the US.
- Between 30 and 50 % of people with diabetes are at risk of kidney disease and older people are particularly at risk.
- People with type 2 diabetes often have microalbuminuria and overt nephropathy shortly after the diagnosis of their diabetes, because diabetes is often present many years before diagnosis.
- The key to preventing kidney damage is early detection of the excretion of protein in the urine and early intervention with treatment.
- People with kidney disease are at higher risk of heart disease. Therefore attention should be given to lowering blood pressure and cholesterol, taking exercise and not smoking
- If the kidneys are not working at full capacity for more than 3 months or are permanently damaged, then this is classed as chronic kidney disease.

## Healthy Kidneys

The healthy balance of our body's chemistry is largely due to the work of our two kidneys that are about the size of a fist and are shaped like beans. They are situated just above the waist in your back and are partly protected by the ribs. You can live a healthy life with only one kidney.

### What do normal kidneys do?

- The kidneys get rid of the body's waste products and excess water as urine. The waste products form from the breakdown of the protein we eat and from normal muscle activity.
- The kidneys also produce hormones that help in the production of red blood cells, build strong bones and help to keep blood pressure under control.

## What causes kidneys to stop working?

- Diabetes
- High blood pressure
- Chronic kidney infections
- Severe injury or birth defects
- Certain drugs and other kidney disease

Inside each kidney there are about one million tiny units called **nephrons** that filter and remove excess fluid and waste products from the blood. The entire body's blood supply circulates through the kidneys every two minutes. The waste products and the fluid that are filtered out are excreted as **urine**. The urine travels through tubes, the **ureters**, into the bladder where it is stored and eventually passes out of the body through another tube called the **urethra**. If the kidneys fail then the harmful waste products build up in the blood, called **uremia**, and you feel ill. Some of the signs and symptoms of kidney failure are:

- Extreme tiredness
- Nausea and vomiting
- Shortness of breath
- Difficulty sleeping
- Difficulties concentrating and confusion
- Swelling of hands, feet and face
- High blood pressure
- Itchiness
- Loss of appetite

## The kidneys and blood pressure

One of the most important functions of the kidneys is the control of blood pressure. High blood pressure (hypertension) is very common in people with kidney failure and can occur from the early stages of kidney damage. But it is a 'chicken and egg' situation - high blood pressure can cause kidney failure but kidney failure can cause high blood pressure. As people with kidney disease have a significantly increased risk of heart disease compared to the general population, it is important that high blood pressure is treated.

# Kidney disease and diabetes

One of the long-term complications of diabetes can be kidney disease and most of us are aware that prevention of the development of kidney disease is one of the reasons that we need to keep good blood glucose control. Aggressive treatment of blood pressure and stopping smoking, are also methods by which kidney disease can be either prevented or treated.

## Definition of kidney disease or nephropathy [its medical name]

Diabetes at Your Fingertips, a very useful book, defines it as:

“In the first instance nephropathy makes the kidney more leaky so that protein [albumin] appears in the urine. At a later stage it may affect the function of the kidney and in severe cases leads to kidney failure.”

## What are the ways in which diabetes can affect the kidneys?

- If there is a lot of sugar in the urine, because you are running high blood sugars for whatever reason, then this can lead to infection that can spread from the bladder to the kidneys. Chronic kidney infections do not always produce symptoms and may only show up on routine clinic tests.
- In both longstanding and poorly controlled diabetes the kidneys have to work hard to get rid of the excess sugar and the small blood vessels in the kidneys can be damaged, in the same way as those supplying the eyes and causing retinopathy. If both diabetes and high blood pressure are present the risk to the kidneys is greater.

## Does kidney damage produce symptoms?

- In the early stages there are no symptoms and any kidney damage should be picked up in the urine tests carried out at your normal clinic visit when albumin levels are measured.
- If large amounts of urine are lost then this leads to frothing of the urine and a build up of fluid in the body with swelling of the ankles [oedema] but this should be spotted in the routine clinic urine tests.

## What is microalbuminuria?

This is the name for the condition described above where abnormal amounts of protein [albumin] leak from the kidneys into the urine. It is the first sign that kidney disease may be developing. If kidney damage progresses then there are increased amounts of protein excreted in the urine and this is called macroalbuminuria.

The presence of microalbuminuria is detected by testing all the urine collected during a 24hour period. The test carried out in the laboratory checks the ratio of albumin to creatinine, another substance that if higher than normal is a good predictor of kidney damage. Creatinine is a waste product produced as a result of muscle activity. The albumin/creatinine ratio is measured in micrograms per milligram. Someone without diabetes normally excretes less than 25 µg/mg per day although this 'normal' figure is less in men [18µg/mg] than in women [25µg/mg].

### Understanding the results

From personal experience, when my daughter was given the results of her first 24 hour urine collection, we knew they were high but did not know how high. The actual figures were meaningless to us because we didn't know the normal range and how high they can go. For example a figure of 29 sounds dreadful but not if you look at the worst possible figures! So that other people are able to understand their results and maybe not worry quite so much, with the permission of Diabetes Interview we are printing their table of ranges of albumin/creatinine ratios:

	MALE	FEMALE
Normal albuminuria	17µg/mg or less	25 µg/mg or less
Low microalbuminuria	18-65µg/mg	26-29µg/mg
High microalbuminuria	66-250µg/mg	93-355µg/mg
Proteinuria	More than 250µg/mg	More than 355µg/mg

**Note – Don't panic at one high result!** Results of urine tests for protein can be high for various reasons - for example it could be due to infections of the kidney, bladder or urethra or if you had been exercising vigorously around the time of the test. If subsequent tests are consistently higher than expected then your doctor should carry out further tests and, if necessary, treatment.

Obviously your doctor will decide when and if you should receive treatment for microalbuminuria. The key to preventing kidney damage is early detection of the excretion of protein in the urine and early intervention with treatment to slow down the progression of microalbuminuria to prevent further kidney damage. Microalbuminuria can progress to renal failure if left untreated.

## The use of ACE inhibitors

ACE inhibitors, are drugs normally used for the treatment of high blood pressure. This is a category of drugs called Angio-Converting Enzyme inhibitors – ACE for short. ACE is an enzyme found in our bodies which activates a hormone called angiotensin causing the blood vessels to constrict, so raising blood pressure and putting pressure on the heart. ACE inhibitors prevent the action of angiotensin resulting in a lowering of blood pressure.

However, there is now evidence that the use of ACE inhibitors in people who start to show small amounts of protein in the urine, helps to reduce the progression to macroalbuminuria. In other words the use of ACE inhibitors has a protective effect on the kidneys, even in people whose blood pressure is normal.

**NOTE** – ACE inhibitors can have fairly mild side effects, the common one being an irritating cough. They are not suitable for everyone so this needs to be discussed with your doctor. They are not recommended for pregnant women.

While there are differing views on the use of ACE inhibitors to protect the kidneys, it is clear that early detection and early intervention is the way to prevent, treat and even regress problems with protein in the urine. There is some debate centred around whether or not people with diabetes should start taking low dose ACE inhibitors before there is any sign of protein in the urine or raised blood pressure to try to prevent the development of microalbuminuria. If people who are at risk of developing kidney disease can be identified, then there appears to be a case for prescribing ACE inhibitors for these people.

## Kidney Failure

Each kidney contains about 1 million nephrons to carry out the filtration of the waste products. If the number of nephrons is reduced by damage to the kidneys then the remaining nephrons work harder and the overall kidney function is maintained. However, once a certain amount of kidney tissue has been damaged the surviving nephrons are under increased pressure, become damaged and the kidney function declines.

## **What can be done if my kidneys fail?**

### **If your kidneys fail then you will be treated like any other kidney patient.**

- Dialysis. There are two forms of dialysis which remove extra water and can keep you fit and well while you are waiting for a transplant. The most suitable type will depend on medical factors.
- Kidney transplantation replaces the lost kidney function. It is a treatment not a cure. For many people it provides the optimum method of treatment because it removes the constraints of dialysis and restores a 'normal' lifestyle. There are two barriers to widespread successful kidney transplantations – a shortage of donor organs and rejection after surgery by the body's immune system.
- A kidney and pancreas transplant may also be considered as an option.
- Dietetic advice on what foods can help to make you feel better.
- Medications from your doctor to help other problems such as blood pressure and water removal.

# Urinary Tract Infections (UTIs)

## What are UTIs?

As the name suggests, urinary tract infections (UTIs) affect your urinary tract. It is a general term for infections that can affect your bladder (cystitis), urethra (urethritis), or kidneys (kidney infection).

Symptoms include:

- pain or a burning sensation when peeing (dysuria)
- needing to pee more often than usual during the night (nocturia)
- pee that looks cloudy, dark or has a strong smell
- needing to pee suddenly or more urgently than usual
- needing to pee more often than usual
- blood in your pee
- lower tummy pain or pain in your back, just under the ribs
- a high temperature, or feeling hot and shivery
- a very low temperature below 36C.

Older or frail people may also experience:

- changes in behaviour, such as acting agitated or confused (delirium)
- wetting themselves (incontinence)
- new shivering or shaking (rigors).

## Why are UTIs more common among people with diabetes?

UTIs are the second most common type of infection. Women are 10 times more likely to get a UTI than men because of their anatomy. In fact, more than 50% of women will have a UTI at some point in their lives. If you're a woman with Type 2 diabetes, your risk may be even higher.

Why are people with diabetes more prone to UTIs? There are likely several reasons.

- (i) People with diabetes may have poor circulation, which reduces the ability of white blood cells to travel in the body and fight off any kind of infection.
- (ii) High blood glucose levels can also raise the risk of a UTI. High levels of glucose in the urine can provide good conditions for the levels of bacteria that can cause UTIs to become a problem.

- (iii) Some people with diabetes have bladders that don't empty as well as they should, due to autonomic neuropathy. As a result, urine stays in the bladder too long and becomes a breeding ground for bacteria.
- (iv) Various impairments in the immune system, poor metabolic control and incomplete bladder emptying due to autonomic neuropathy may all contribute to the enhanced risk of urinary tract infections in these patients.

### **How are UTIs diagnosed?**

UTIs are usually diagnosed by testing a urine sample for the presence of bacteria. If UTIs become a regular and/or persistent problem you may be referred for other tests such as ultrasound, MRI or CT scan.

See a GP if:

- you have symptoms of a urinary tract infection (UTI) for the first time
- you're a man with symptoms of a UTI
- you're caring for an older, frail person who may have symptoms of a UTI
- you have symptoms of a UTI after surgery
- your symptoms get worse or do not improve within 2 days
- your symptoms come back after treatment.

### **New quality standard identifies improvements in UTI diagnosis**

The UK updated quality standard on urinary tract infections (UTI) in adults says healthcare professionals should diagnose women under 65 with a UTI if they have 2 or more key urinary symptoms. Women who present with 2 or more key symptoms should not require a dipstick test. Professionals should exclude any other causes of urinary symptoms and consider warning signs of other conditions such as sepsis and cancer when diagnosing a UTI.

## **How are UTIs treated?**

Treatment from a GP may include:

- offering self-care advice and recommend taking a painkiller
- giving you a prescription for a short course of antibiotics
- giving you a prescription for antibiotics, but suggest you wait for 48 hours before taking them in case your symptoms go away on their own.

If your UTI keeps coming back or recurs within 6 months then your GP may:

- prescribe a different antibiotic or prescribe a low-dose antibiotic to take for up to 6 months
- prescribe a vaginal cream containing oestrogen, if you have gone through the menopause
- refer you to a specialist for further tests and treatments.

In some people, antibiotics do not work or urine tests do not pick up an infection, even though you have UTI symptoms. This may mean you have a long-term (chronic) UTI that is not picked up by current urine tests. You should consider asking the GP for a referral to a specialist for further tests and treatments.

## **Things you can do yourself to help ease symptoms of a urinary tract infection (UTI):**

- that paracetamol up to 4 times a day to reduce pain and a high temperature – for people with a UTI, paracetamol is usually recommended over NSAIDs such as ibuprofen or aspirin
- rest and drink enough fluids so you pass pale urine regularly during the day
- avoid having sex.

## A pharmacist can help with UTIs. A pharmacist can:

- suggest the best painkiller to take
- tell you if you need to see a GP about your symptoms
- some pharmacies offer a UTI management service. They may be able to give antibiotics if they're needed.

## Prevention

As is always the case, prevention is always better than cure These are some Do's and Don'ts, recommended by the NHS to avoid UTIs:

<b>Do</b>	<b>Don't</b>
wipe from front to back when you go to the toilet	do not wear tight synthetic underwear, such as nylon, wear cotton instead
keep the genital area clean and dry	do not use scented soap
drink plenty of fluids, particularly water – so that you regularly pee during the day and do not feel thirsty	do not hold your pee in if you feel the urge to go, do not rush when going for a pee – try to fully empty your bladder
wash the skin around the vagina with water before and after sex	do not use condoms or a diaphragm or cap with spermicidal lube on them – try non-spermicidal lube or a different type of contraception
pee as soon as possible after sex	do not drink lots of alcoholic drinks, as they may irritate your bladder
promptly change incontinence pads if they're soiled	

People sometimes recommend taking D-mannose or Cranberry products to prevent UTIs coming back. However:

- D-mannose and cranberry products can contain a lot of sugar and can raise your blood sugar levels
- lots of sugary food or drinks may increase the amount of sugar in the urinary tract and encourage bacteria to grow
- there is little scientific evidence to show that these products have a beneficial effect
- if you're taking warfarin, you should avoid cranberry products.

The NHS website is a useful source of information about UTIs. Go to: <https://www.nhs.uk/conditions/urinary-tract-infections-utis/>

## Useful organisations for more information:

### **Kidney Care UK**

3 The Windmills, St Mary's Close, Turk Street, Alton GU34 1EF  
Tel: 01420 541424 Website: <http://www.britishkidney-pa.co.uk/>

### **Kidney Research UK**

Stuart House, City Road, Peterborough PE1 1QF  
Tel: 0300 3031100 Email: [enquiries@kidneyresearchuk.org](mailto:enquiries@kidneyresearchuk.org)  
Website: <https://www.kidneyresearchuk.org>







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**For further information about  
all our FREE leaflets contact us:**

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