

# Proteinuria

## (protein in the urine)

This infoKID topic is for parents and carers about children's kidney conditions. Visit [www.infoKID.org.uk](http://www.infoKID.org.uk) to find more topics about conditions, tests & diagnosis, treatments and supporting information.

Each topic starts with an overview followed by several sections with more information.

» [Links to sections](#) in topic | [Other topics](#) available on website

Proteinuria means there is more protein than normal in the urine (wee). Normally there is very little protein in the urine. Many children with proteinuria have no symptoms. Although all children who have proteinuria need tests, in many it goes away without treatment.

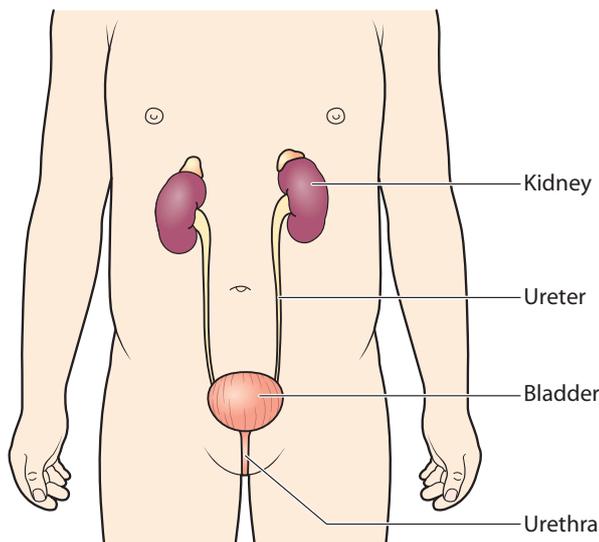
In a few children, the proteinuria is a sign of a problem with their kidneys, and these children may need special treatment.

The information covers:

- what proteinuria is
- what may cause proteinuria
- how your doctor can find out whether your child has proteinuria
- treatment that your child may need
- monitoring proteinuria, including testing your child's urine at home
- any long-term effects of proteinuria.



## Overview



### About the urinary system

The **urinary system** gets rid of things that the body no longer needs, so that we can grow and stay healthy.

The **kidneys** are bean-shaped organs. They filter blood to remove extra water and waste in urine (wee). Most of us have two kidneys. They are at the back on either side of our spine (backbone), near the bottom edge of our ribs.

The two **ureters** are long tubes that carry urine from the kidneys to the bladder.

The **bladder** is a bag that stores urine until we are ready to urinate. It sits low down in the tummy area.

The urethra is a tube that carries urine from the bladder to the **outside** of the body.

## About proteinuria

**Proteinuria** means there is more protein than normal in the urine. It happens when the kidneys leak protein into the urine. **Protein** is an important part of our diet and is in most foods.

There are different types of proteins in the blood. The most common type is called **albumin**.

Often, only albumin is found in the urine – this is called **albuminuria**.

If there is only a very small amount of albumin in the urine, this is called **microalbuminuria**.

### How common is proteinuria?

Doctors have found proteinuria in about 2 or 3 out of 100 children of any age. In most children this is mild proteinuria that is harmless.

Almost 1 in 100 children have **persistent** proteinuria, which means that it continues over time. This may be more serious.

## Symptoms

Most children with proteinuria do not have any **symptoms**. You cannot usually see protein in the urine, but occasionally the urine looks frothy.

### Nephrotic syndrome

When the kidneys leak *a lot of* protein this is called **nephrotic-range proteinuria**. This causes **nephrotic syndrome**.

Children often have swelling in their body, especially their face, legs and feet.

### Haematuria

**Haematuria** means there is blood in the urine – if there is a lot, the urine may be red or dark brown. This is occasionally seen with proteinuria.

## Causes

Some children have protein in their urine only at certain times of the day, after exercise, or during a fever or a urinary tract infection when germs get into the urine and travel up the urinary system. In these cases, it is not serious.

A small number of children have large amounts of protein in their urine, or have **persistent proteinuria** – this may happen:

- with **nephrotic syndrome**
- with **renal dysplasia** (when one or both kidneys have not developed properly) and **reflux** (when urine goes back up towards the kidneys)
- because of another condition that affects the kidneys
- with high blood pressure (**hypertension**).

» [More about causes](#)

## Tests and diagnosis

Your child's doctor can **diagnose** (identify) proteinuria with a **urine test**. Proteinuria may be found during a urine test for another reason – for example, if your doctor thinks your child has another condition or during a routine health check. Your doctor will also speak with you and your child about his or her symptoms and examine your child.

If the first test shows there is protein in your child's urine, he or she will need more tests to help find out whether the proteinuria is serious.

Your child may need further tests, such as **blood tests**.

» [More about tests and diagnosis](#)

## Treatment

Many children will *not* need treatment. Some children will need to be monitored or treated, and may need to take medicines to reduce the amount of protein lost in their urine or control their blood pressure.

» [More about treatment](#)

## About the future

For many children, proteinuria is mild and will go away in a few weeks without any treatment.

In a few children, proteinuria is a sign of kidney damage – for example, scars or inflammation. Often this damage is minor and their kidneys work normally. They may need to go back to hospital or clinic for occasional follow-up appointments.

A very small number of children will have long-term problems with their kidneys. These children may need further care. They will need to go back to the hospital or clinic for regular follow-up appointments.

» [More information about the future](#)

# Causes

Your doctor will try to find out why your child has proteinuria, though this is not always possible. Proteinuria may be mild and last for a short time, or it may be more severe and last for a long time.

## How proteinuria happens

The kidneys have many tiny filters (**glomeruli**). They normally help remove extra water and waste, which are passed out in urine, and make sure the body keeps what it needs, including protein.

In proteinuria, the glomeruli become more leaky than usual.

## About protein

**Protein** is an important part of our diet and is in most foods. When we eat protein, it is digested (broken down) in the stomach and intestines and taken into the blood.

There are different types of proteins in the blood. The most common type is called **albumin**.

Often, only albumin is found in the urine – this is called **albuminuria**. If there is only a very small amount of albumin in the urine, this is called **microalbuminuria**.

## Causes of mild or short-term proteinuria

Proteinuria may be mild if it happens during the daytime with only small amounts of protein leaked, or it lasts for a short time during a fever or urinary tract infection.

### Orthostatic proteinuria

Sometimes the kidneys leak a small amount of protein during the daytime, especially when standing up and after exercise. This is called orthostatic proteinuria ('orthostatic' refers to standing up) or postural proteinuria. In these cases the proteinuria is harmless.

### During a fever or urinary tract infection

The kidneys may also leak some protein during a fever or a **urinary tract infection (UTI)**, when germs get into the urine and travel up the urinary system. The proteinuria usually disappears after the child gets better, and does not cause any long-term problems.

## Causes: Read more about how the kidney works and protein leak

### How the kidney works

Inside each kidney, there are about one million **nephrons**. Each nephron is made up of a **glomerulus** (when we talk about more than one glomerulus, we say glomeruli), and a **renal tubule**.

- Each glomerulus acts like a sieve, helping to remove extra water and waste from the body, and holding on to blood cells and protein, which the body needs.
- Blood flows into the kidneys and to each glomerulus.
- Most of the water and some other substances in the blood pass through the glomeruli.
- This liquid flows into the renal tubule. Most of this liquid moves back into the bloodstream. The rest of it becomes urine.
- The urine leaves the kidney by the ureters and goes into the bladder, where it is stored until we are ready to go to the toilet.

» [More about what the kidney does](#)

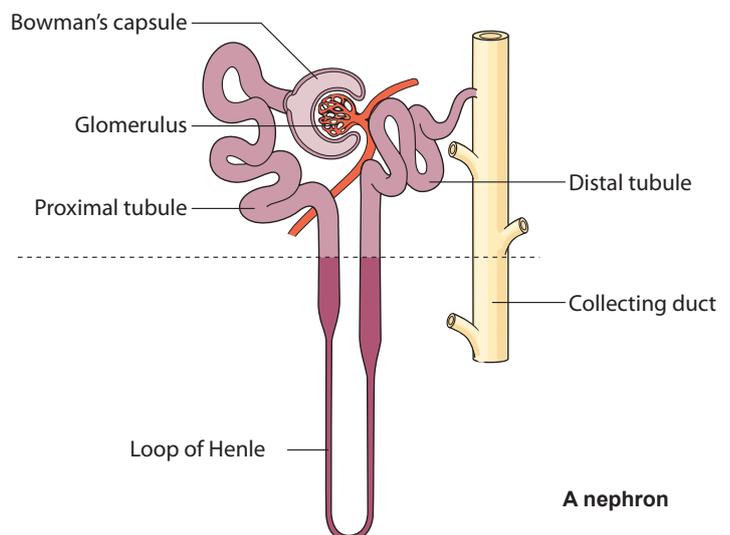
### Protein leak in the glomeruli

Most proteins are too big to pass through the glomeruli, and stay in the bloodstream. In proteinuria, the glomeruli become more leaky than usual. More proteins than usual pass through the glomeruli, and leave the body in urine.

### Protein leak in the renal tubules

Some small proteins do get through healthy glomeruli and pass into the renal tubule. Most of these are re-absorbed into the bloodstream.

If the tubules are damaged, they may be unable to remove the proteins back into the bloodstream. The proteins are then lost into urine.



## Causes of severe or persistent proteinuria

A small number of children have large amounts of protein in their urine, or have **persistent proteinuria** (that does not go away). These *may* be signs of damage in the kidneys.

### Nephrotic syndrome

**Nephrotic syndrome** happens when a lot of protein is leaked into the urine. This means that there is less protein in the blood. This amount of proteinuria is called nephrotic-range proteinuria.

Children with nephrotic syndrome have swelling around their eyes or their legs or feet. Many children with this condition get better after taking medicine for a few weeks, but a few need special treatment.

This type of proteinuria is very rare. It is seen in 1 or 2 children in every 100,000.

### Reflux

Some children are born with **vesicoureteral reflux (VUR)**. In VUR, some urine refluxes (goes back up) towards the kidneys.

This makes it easier for germs that cause UTI to travel all the way up to the kidneys, where they cause a more

serious infection and illness. An infection in the kidney is called **pyelonephritis**. When this happens, the kidneys can get scars and leak protein.

### Renal dysplasia

Some children who have reflux also have **renal dysplasia**. One or both kidneys did not develop normally while they were growing in the womb. The affected kidney may leak protein.

### Kidney conditions

Some kidney conditions that may cause proteinuria include:

- **glomerulonephritis**
- **acute kidney injury**
- vasculitis
- diabetes, when it affects the kidneys
- diseases that affect the **renal tubules** (the kidney's tubes that carry the liquid that will become urine) – these are very rare, and include Dent disease, Lowe syndrome, Fanconi syndrome and aminoaciduria.

### Hypertension

**Hypertension** is blood pressure that is too high. Occasionally, this can be linked to proteinuria.

## Causes: Read more about types of proteins and kidney conditions

### Proteins

#### Albumin

There is more **albumin** than any other type of protein in our blood. Most of the time, the protein that is lost in the urine in proteinuria is albumin. This is because albumin is smaller than other proteins. If a glomerulus (kidney filter) is only slightly damaged, it can let albumin pass through.

#### Globulin

**Globulin** is another type of protein. This protein is larger than albumin. If a glomerulus is more seriously damaged, it can let globulins pass through.

#### Other proteins

Other types of protein are smaller and so can easily pass through the glomeruli and into the renal tubules. The **renal tubules** normally remove these proteins back into the **bloodstream**. If the renal tubules are not working properly, they may not remove the proteins, which means they are lost in the urine. This happens in:

- rare diseases of the renal tubules – including Dent disease, Lowe syndrome, Fanconi syndrome and aminoaciduria
- **acute kidney injury** – the kidneys suddenly stop working
- **acute interstitial nephritis** – inflammation of the kidneys, sometimes caused by the use of some medicines.

### Kidney conditions

- **Glomerulonephritis** is a group of conditions that cause inflammation in the glomeruli. Children with this condition have blood and protein in their urine, and may have swelling in their body, especially around their face and legs. Some children need special treatment.
- **Acute kidney injury** means that the kidneys stop working as well as they should – this happens over a short period of time. Many children get better after a few weeks without treatment, but others need to take medicines or have more intensive treatment.
- Vasculitis happens when the blood vessels in different parts of the body become inflamed – this can sometimes affect the blood vessels in the kidneys.
- Children who have diabetes are not able to convert (change) sugar into energy in the way they should. This can sometimes cause problems in their kidneys – called diabetic nephropathy – although this is rare in children. It usually happens after years of living with diabetes, and is more likely if the diabetes is not well controlled.

# Tests and diagnosis

Your child's doctor can diagnose (identify) proteinuria with a urine test. Because proteinuria may not have symptoms, it is often found with urine tests done for other reasons. Your child may need other tests.

Your doctor may talk to you or your child about his or her symptoms and any medicines that he or she takes, and examine your child. Your doctor or nurse will check your child's blood pressure to find out whether it is in a healthy range.

## Urine tests

You, or a nurse, will need to collect some of your child's urine in a small, clean container for a **urine test**.

A **dipstick** will be dipped into the urine – this is a strip with chemical pads that change colour depending on what substances are in the urine. This shows whether there is protein in the urine.

If the first urine test shows protein in your child's urine, your doctor may arrange for more urine tests. Many children have a little protein in their urine occasionally – testing the urine again will confirm whether your child continues to have protein in their urine. You will need to collect samples of your child's **first morning urine**, the urine passed when they first wake up in the morning.

The samples may also be sent to a laboratory for more accurate tests, such as measuring the amount of protein.

### Testing urine at home

You may need to test your child's urine at home to find out whether the proteinuria is still present. You will need to collect a sample of your child's urine each morning, and test it with a **dipstick**. Your doctor or nurse will give you some equipment and show you what to do.

### Urine test – 24-hour sample

A small number of children need their urine collected over a whole day and night. This can give a more accurate measurement of how much protein is being leaked.

### Urine test for infections

Because proteinuria can happen with **urinary tract infections**, your child's urine may need to be tested to find out whether there is an infection. The test is called a **urine culture**.

» **Read more about urine and blood tests on the next page**



## Further tests

Your child may need further tests to confirm that he or she has proteinuria, what is causing it, and whether he or she has another health condition. These tests will help decide whether your child needs any treatment.

### Blood tests

In **blood tests**, a small amount of blood may be taken from a vein, with a needle and syringe. Special gel or cream can be used to help your child stop feeling any pain. The blood test results can give the doctor more information, including:

- whether your child has had a recent infection
- how well the kidneys are working – this is called the **kidney function**
- the amount of protein in the blood – because the kidneys leak protein into urine in proteinuria, this is sometimes enough to affect how much protein is in the blood.

### Imaging tests

Some children need **imaging tests**. These use special scanners that get images (pictures) of the inside of their body.

An **ultrasound scan** looks at the shape and size of kidneys and other parts of the urinary system. A small handheld device is moved around your child's skin and uses sound waves to create an image on a screen.

Occasionally, other imaging tests are needed.

### Kidney biopsy

Some children need a **kidney biopsy**. A tiny piece of one kidney is removed from the body with a needle. This is examined under microscopes. Special medicines are used so your child does not feel any pain or can sleep through the procedure. It can take a few weeks to get the results.

### Referral

Your child may be referred to a **paediatrician**, a children's doctor, usually based in a hospital, or a **paediatric nephrologist**, a doctor who treats children with kidney problems.

This may happen if your child has **persistent proteinuria** (that does not go away), or a high level of proteinuria.

## Urine tests

### Measuring the amount of protein

The dipstick urine test will show whether there is any protein in the urine, but it does not give an accurate measurement.

The following tests are done in a laboratory:

- the **urine protein:creatinine ratio (PCR)** – this compares the amounts of protein and creatinine in the urine. Creatinine is made all the time by muscles and is normally removed by the kidneys in urine
- the **albumin:creatinine ratio (ACR)** – this compares the amounts of albumin and creatinine in the urine.

### Defining proteinuria

**Proteinuria** is usually defined as a PCR of more than 50 mg/mmol. (This may be slightly different in different laboratories.)

**Nephrotic-range proteinuria** is usually defined as a PCR more than 200 mg/mmol. This means that *a lot of* protein is leaked into the urine, and so there is less protein in the blood.

» [More about urine tests on www.infoKID.org.uk](http://www.infoKID.org.uk)

## Blood tests

### Infection and the immune system

A blood test can check whether there are any **antibodies** – the body's **immune system** makes these special proteins to identify and kill specific germs. This gives information about whether there has been an infection, and sometimes which germ caused it.

### How well the kidneys are working

**Urea** and **creatinine** are chemicals that are made in the body. They are waste products and are normally removed by the **kidneys** into **urine**. In severe proteinuria, these may build up in the blood.

The **kidney function** can be measured with the **glomerular filtration rate (GFR)**. The GFR is the amount of fluid (liquid) the kidneys filter each minute. It can be estimated by measuring the amount of creatinine in the blood.

### Protein in the blood

Children with proteinuria lose protein in their urine. Some children lose a lot of protein, which means there is less protein in their blood. Albumin is one type of protein in the blood – because it is small, albumin is more likely to leak through the glomeruli.

### Other chemicals

**Electrolytes** are important chemicals in the body. We need the right balance of these to stay healthy. Some important electrolytes include the following:

- **sodium** helps balance the amount of water in the body
- **potassium** is needed for the muscles, including the heart muscle, to work properly
- **bicarbonate** balances the amount of acid in our body, or the pH balance (also called the acid–base balance)
- **phosphate** is important for bones, teeth and muscles
- **calcium** is important for bones and teeth, helps blood to clot and also helps the muscles, including the heart muscle, to work.

» [More about blood tests on www.infoKID.org.uk](http://www.infoKID.org.uk)

# Treatment

After your child's doctor has confirmed the diagnosis and the type of proteinuria, he or she will decide on the best treatment plan for your child.

## When treatment is needed

Your child will *not* need treatment for:

- **orthostatic proteinuria** – the kidneys leak a small amount of protein during the day, especially when standing up or after exercise
- **mild proteinuria** that goes away after the first urine test – this may happen during a fever or a urinary tract infection.

Your child *may* need treatment or to be monitored for:

- **persistent proteinuria** – where the proteinuria does not go away
- **nephrotic syndrome**
- **kidney damage**, if it is suspected.

→ It is important that your child follows the treatment plan outlined by your doctor.

## Reducing protein lost in urine

**Angiotensin-converting enzyme inhibitors (ACE inhibitors)** and **angiotensin receptor blockers (ARBs)** may be used to reduce the amount of protein lost in the urine. They may also be used to help reduce or control blood pressure. Common ACE inhibitors are: **captopril**, **enalapril** and **lisinopril**.

Doctors understand that in some children these medicines will reduce the risk of long-term kidney problems.

## Controlling blood pressure

Some children with proteinuria also have high blood pressure, or **hypertension**. Their blood pressure will need to be controlled so it is in a healthy range.

If your child has hypertension, he or she may need to change what he or she eats and drinks. Some children need to take medicines.

## Questions to ask the doctor or nurse

- What treatment will my child need?
- How will the treatment help my child?
- What are the side-effects of the treatment?
- How can I help my child prepare for procedures and treatments?
- If the first treatment does not work in my child, what happens next?
- How will I know if we need to go back to the hospital or see the doctor?

# About the future

Your healthcare team will speak with you and your family about any long-term effects your child might have with proteinuria. In most children, proteinuria is mild.

## Follow up

Your child may need to have follow-up appointments at the hospital or clinic, especially if he or she has persistent proteinuria. It is important to go to these appointments, even if your child seems well – remember to bring the results from home urine testing. You will also have the opportunity to ask any questions.

At these appointments, your child may have:

- his or her height and weight checked
- a physical examination
- urine tests – to check for protein and other substances in his or her urine
- blood tests – to check for the amount of protein and other substances in his or her blood, and measure his or her kidney function
- his or her blood pressure measured.

→ It is important that your child keeps all the appointments for these tests, to help prevent long-term damage to his or her kidneys.

## Urine testing at home

You may need to continue to do urine tests at home to check whether the proteinuria has come back. If there is proteinuria for a few days, contact your doctor.

## Long-term effects

### Mild proteinuria

In most children, proteinuria is only present for a short time. It is harmless and will not cause problems in the long term.

## Other types of proteinuria

Children who have the following may need to have treatment or be monitored:

- **persistent proteinuria**
- **nephrotic syndrome.**

## Kidney damage

In a small number of children the proteinuria is a sign that there may be kidney damage – for example, scars or inflammation (like swelling) in the kidney. Often this damage is minor and the kidneys are working normally.

A very small number of children will have long-term problems with their kidneys. Their kidneys stop working as well as they should – this happens slowly, often over many years. This is called **chronic kidney disease** (CKD).

If your child has CKD, you and your family will learn more over time about how to help manage the condition, and what to expect.

## Impact on your child and your family

Children who have proteinuria can usually do the things that other children their age do. Often no treatment is

required and they should be able to continue going to school or nursery. They can play with other children and stay active.

Some children may need to change their diet and take one or more medicines.

## Further support

This can be a stressful time for your child and the whole family, including other children.

If your child's proteinuria is due to a more serious kidney problem, your doctor or nurse will give you more information.

→ **If you have any concerns or need additional support, speak with your doctor or nurse.**

## Further information

This is the end of the information on proteinuria. If you would like to read more about other conditions affecting the kidneys, tests and diagnosis, treatment or supporting information, you can find a list of topics covered on the infoKID website at [www.infoKID.org.uk](http://www.infoKID.org.uk).

## Your notes and contact information

[www.infoKID.org.uk](http://www.infoKID.org.uk)



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For details on any sources of information used in this topic, please contact us through our website, [www.infoKID.org.uk](http://www.infoKID.org.uk)

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