

Causes

Kidney failure can be caused by many underlying issues and generally falls into two categories of disease, classified as acute or chronic. Acute diseases generally develop quickly, lasts for a limited amount of time and are more immediately severe than chronic conditions (think food poisoning). However, acute disease can also develop or cause lingering problems. Chronic diseases generally develop and worsen over time and do not go away.

In adults the most common causes of kidney failure are diabetes and hypertension. In children congenital defects causing urinary tract blockages (posterior urethral valves) or small or non-functioning kidneys (hypoplastic and dysplastic) or another disorder that causes scarring of the glomeruli that leads to nephrotic syndrome (Focal Segmental Glomerulosclerosis), are the most common causes. ⁽¹⁾

Until age 4, birth defects and hereditary diseases are by far the leading causes of kidney failure. Between ages 5 and 14, hereditary diseases continue to be the most common causes, but glomerular disease incidence rises. As children age past 15, glomerular diseases are the leading cause, and hereditary diseases become rarer.

Acute Diseases

Acute kidney disease can come from poisoning, but often comes from an injury. Injuries that result in blood loss may temporarily reduce kidney function; however once blood loss is limited, the kidneys usually recover.

- **Hemolytic uremic syndrome (HUS)** - is rare disease that affects children mostly under 10 years of age and can result in kidney failure. HUS is caused by eating foods contaminated by *Escherichia coli* (*E coli*) bacteria, which leads to an infection in the digestive system. Poisons produced by the bacteria can damage the kidneys, causing acute kidney failure. Children with HUS may need blood transfusion or dialysis for a short time. Most however, return to normal after a few weeks, and only a small percentage of children (mostly those who have severe acute kidney disease) will develop chronic kidney disease.
- **Nephrotic Syndrome ? is a set of symptoms that tends to affect children ages 1½ and 5 years** and is more commonly found in boys. A child with this syndrome will urinate less often, causing fluid to accumulate and produce swelling around the eyes, legs, and belly. The small amount of urine the body makes contains high levels of protein. Healthy kidneys keep protein in the blood, but damaged kidneys let it leak from the blood into the urine. Nephrotic syndrome is usually treated with prednisone to stop protein leakage, and sometimes a diuretic is used to help the child urinate and reduce the swelling. Usually, the child can take smaller and smaller doses of prednisone and eventually return to normal with no lasting kidney damage. This temporary condition is called minimal change disease. Relapses are common but

usually respond to additional prednisone treatment.

Chronic Kidney Diseases

Unfortunately, the conditions that lead to chronic kidney failure in children cannot be easily fixed. Often, the condition will develop silently and goes unnoticed until the kidneys have been permanently damaged. Treatment may slow down the progression of some diseases, but in many cases the child will eventually need dialysis or transplantation.

- **Birth defects** - some babies are born without one or both kidneys or have abnormally formed or non-functioning kidneys. Kidney abnormalities can also be a part of a syndrome that affects many parts of the body.
 - **Horseshoe kidney** - where the two kidneys are fused (connected) into one arched kidney that usually functions normally, but is more prone to develop problems later in life. An uncomplicated horseshoe kidney does not need medical or surgical treatment, but it does need to be checked regularly by doctors.
 - **Fetal hydronephrosis** ? is an enlargement of one or both of the kidneys is caused by either an obstruction in the developing urinary tract or a condition called **vesicoureteral reflux (VUR)** in which urine abnormally flows backward (or refluxes) from the bladder into the ureters. Fetal hydronephrosis is usually diagnosed before the child is born and treatment varies widely. In some cases the condition only requires ongoing monitoring; in others, surgery is the only way to clear the obstruction from the urinary tract.
- **Blocked urine flow and reflux** - if blockage develops between the kidneys and the opening where urine leaves the body, the urine can back up and permanently damage the kidney.
 - **Posterior urethral valve obstruction** - this narrowing or obstruction of the urethra affects only boys. It can be diagnosed before the baby is born or just afterwards and treated with surgery.
 - **Congenital problems with the urinary tract** ? as a child develops in the womb, a part of the urinary tract can grow to an abnormal size or in an abnormal shape or position.
 - **Duplication of the ureters** ? is an example of a congenital defect, where a kidney has two ureters instead of one. This can lead to urinary tract infections over time and can be treated with medication or occasionally with surgery.
- **Polycystic Kidney Disease (PKD)** - is a condition in which many fluid-filled cysts develop in both kidneys. The cysts develop, multiply and can lead to kidney failure. Most forms of PKD are inherited, and diagnosis can be made before or after the child is born. One of the primary symptoms in expecting mothers is a lack of amniotic fluid. In some cases, there are no symptoms and in others, PKD can lead to urinary tract infections, kidney stones, and high blood pressure. Treatment for PKD also varies widely. In some cases, PKD can be managed with dietary changes, but in others it requires a kidney transplant or dialysis.
- **Multicystic Kidney Disease (MKD)** - is when large cysts develop in the kidney that hasn't developed properly, eventually causing it to stop functioning. The difference between PKD and MKD is that PKD affects both kidneys, while MKD usually impacts only one. Fortunately, the unaffected kidney takes over and most people with MKD

will have normal kidney function. MKD usually is diagnosed by prenatal ultrasound before a baby is born. Doctors manage it by monitoring blood pressure and screening for a urinary tract infection when needed. In extremely rare instances, surgical removal of the kidney may be necessary.

- **Renal tubular acidosis** - is a condition in which the kidneys do not properly regulate the amount of acid in the body. It can cause kidney stones and affect a child's growth, but usually can be treated with medications.
- **Glomerulonephritis** - is an inflammation or infection of the glomeruli. It can affect the kidney's ability to properly filter out waste and can lead to swelling, blood in the urine, and a reduced amount of urine production. Some cases can be treated with medication, while others require dialysis or a kidney transplant. If the damage to the glomeruli is severe, kidney failure may develop.
- **Systemic diseases** - diabetes and lupus are the two most common syndromes in children and can affect many parts of the body, including the kidneys. In lupus, the immune system becomes overactive and attacks the body's own tissues. Diabetes leads to high levels of blood glucose that damage the glomeruli. In children, diabetes is low on the list of causes because it usually takes many years of high blood glucose for the kidney disease of diabetes to develop. However, an increasing number of children have type 2 diabetes, and as a result, we may see more children with chronic kidney failure caused by diabetes in the future. (2)

References

1. Warady, Bradeley M.D. End-Stage Renal Disease in Children: What Causes it? Retrieved from <http://www.aakp.org/aakp-library/ESRD-in-Children/> [1].
2. National Kidney & Urologic Diseases Information Clearinghouse (NKUDIC). (2010), *Overview of Kidney Diseases in Children*. Retrieved from <http://kidney.niddk.nih.gov/kudiseases/pubs/childkidneydiseases/overview> [2].

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[1] <http://www.aakp.org/aakp-library/ESRD-in-Children/>

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