Kidney stones

Description

Kidney stones are small, hard deposits that form in one or both kidneys. The stones are made up of minerals and other substances that are found in the urine. Kidney stones vary in size, shape, and color. To be cleared from the body, the stones travel through the ducts (ureters) that carry urine from the kidneys to the bladder and then leave the body during urination.

Depending on their size, kidney stones generally take days to weeks to pass from the kidney to the bladder. While some small stones pass through the kidneys, ureters, and bladder (urinary tract) with little discomfort, others can cause pain during this process. Larger kidney stones can block the flow of urine and impair kidney function. Stones that are difficult to clear can be removed with surgery.

Some people with kidney stones experience pain in their sides, back, groin, or belly. The pain may come and go, and the site of the pain can change as the stone moves through the urinary tract. In addition to pain, people with kidney stones can also experience nausea and vomiting.

Affected individuals may also feel a constant need to urinate and may experience pain while urinating. People with kidney stones may also have blood in their urine (hematuria) or an infection in the kidneys or urinary tract.

There are several types of kidney stones. The various types are made of different substances and have different causes, so knowing the specific type of kidney stone can help with treatment and prevention. Kidney stones that are mostly made of calcium (calcium stones) are the most common type.

Kidney stones occur most often in people between the ages of 40 and 60, although they can develop at any age. Research shows that up to 50 percent of people who have one kidney stone will develop additional stones. Kidney stones are also associated with an increased lifetime risk of chronic kidney disease (CKD) and kidney failure.

Frequency

Kidney stones affect approximately 10 percent of people worldwide. Research suggests that the prevalence of kidney stones is increasing.

Causes

Kidney stones can be caused by a variety of factors. In many cases, common changes in several genes likely combine with environmental and lifestyle factors to increase the risk of developing kidney stones.

Many of the genes that are associated with kidney stones help regulate the levels of minerals, such as calcium, and other substances in the body. Some of these genes play a role in transporting materials into and out of cells, while others are involved in cell communication. An imbalance of minerals and other substances in the urine can increase the likelihood that kidney stones will form.

Environmental and lifestyle factors can also increase the risk of developing kidney stones. Too little water in the body (dehydration) is a common cause of kidney stones. When a person is dehydrated, the urine becomes more concentrated, which allows minerals and other substances to cluster together to form stones. Diets that are high in animal protein or sodium can also increase the likelihood of developing kidney stones. Medications that change the makeup of the urine can also increase the risk. These include certain medications that help remove salt and water from the body (diuretics) and certain drugs used to treat seizures.

Not all people who have a genetic or environmental risk factor will develop kidney stones. However, when someone with genetic risk factors also experiences one or more environmental or lifestyle risk factors, they may be more likely to develop kidney stones.

Common health conditions may also increase the risk of developing kidney stones. These include obesity, type 2 diabetes, inflammatory bowel disease, inflammation in the joints caused by high levels of uric acid in the blood (gout), and overactive parathyroid glands (hyperparathyroidism).

Less commonly, a rare variant in a single gene can cause kidney stones. This is more likely for individuals with a family history of kidney stones, individuals with recurrent episodes of kidney stones, and individuals who develop kidney stones at a younger age. When kidney stones are caused by a variant in a single gene, they may be part of a syndrome that affects other parts of the body. Examples of genetic syndromes with kidney stones as a feature include Dent disease, cystinuria, primary hyperoxaluria, and Bartter syndrome.

Inheritance

When kidney stones are caused by a combination of genetic and environmental factors, they do not follow a clear pattern of inheritance. However, the risk of developing kidney stones is greater for individuals who have a family history of the condition.

Kidney stones that are caused by a rare variant in a single gene can be inherited in different ways, depending on the particular gene involved.

When kidney stones are part of a genetic syndrome, they follow the inheritance pattern of that syndrome.

Other Names for This Condition

- Calculus of kidney
- Calculus, kidney
- Calculus, renal
- Kidney calculi
- Kidney stone
- Nephrolith
- Nephrolithiasis
- Renal calculi
- Renal calculus
- Renal lithiasis
- Renal stones
- Urinary stones
- Urolithiasis

Additional Information & Resources

Genetic Testing Information

- Genetic Testing Registry: Nephrolithiasis/nephrocalcinosis (https://www.ncbi.nlm.nih.gov/gtr/conditions/CN580796/)

Patient Support and Advocacy Resources

- National Organization for Rare Disorders (NORD) (https://rarediseases.org/)

Clinical Trials

- ClinicalTrials.gov (https://clinicaltrials.gov/search?cond=%22Kidney stones%22)

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28Kidney+Calculi%5BMAJR%5D%29+AND+%28kidney+stone%5BTI%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1440+days%22%5Bdp%5D)

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