

Overview

Kidney stones (calculi) are hardened mineral deposits that form in the kidney. They originate as microscopic particles or crystals and develop into stones over time. The medical term for this condition is nephrolithiasis, or **renal stone disease**.

The kidneys filter waste products from the blood and add them to the urine that the kidneys produce. When waste materials in the urine do not dissolve completely, crystals and kidney stones may form.

Stones may pass out of the kidney, become lodged in the tube that carries urine from the kidney to the bladder (ureter), and cause severe, excruciating pain that begins in the lower back and radiates to the groin. A lodged stone can block the flow of urine, causing pressure to build in the affected ureter and kidney. Increased pressure results in stretching and spasm, which cause the severe pain.

Stone Formation

Kidney stones form when there are too many chemicals to easily dissolve in the available urine. The most common causes of this are:

a high level of urinary calcium (hypercalciuria),

high urinary oxalate (hyperoxaluria),

high urinary uric acid (hyperuricosuria),

insufficient urinary citrate, or

inadequate water flowing through the kidneys.

The kidneys must maintain an adequate amount of water in the urine to dissolve all the removed waste products. If dehydration occurs, high levels of substances that do not dissolve completely (e.g., calcium, oxalate, uric acid) may form crystals that slowly build up into kidney stones.

Urine normally contains chemicals—citrate, magnesium, pyrophosphate—that help prevent the formation of crystals and stones. Low levels of these inhibitors can contribute to the formation of kidney stones. Of these, citrate is the most important.

Incidence and Prevalence

People who live near large bodies of water (e.g., Great Lakes, Gulf of Mexico), those who live in "soft" water areas, and those who have a sibling or parent with the condition experience a higher incidence of renal stone disease.

According to the U.S. National Institutes of Health (NIH), roughly 1 person in 10 develops kidney stones during their

lifetime and renal stone disease accounts for 7–10 of every 1000 hospital admissions. Kidney stones are most prevalent in patients between the ages of 30 and 45, with men affected three times more often than women. Overall incidence declines after age 50.