1. INTRODUCTION

1.1 Prevalence

Kidney stone is one of the most common disorders of the urinary tract. According to one of the surveys conducted in United States, patients made more than 1.3 million visits to health care providers to have their stones treated in 1997. In 1999, more than a quarter million hospitalized patients had a diagnosis of kidney stones. An estimated 10% of people in the United States are likely to have a kidney stone at some point in their lives. Men tend to be affected more frequently than women.

Most kidney stones pass out of the body without any intervention by a physician. Stones that cause lasting symptoms or other complications may be treated by various techniques, most of which do not involve major surgery. Also, research advances have led to a better understanding of the many factors that promote stone formation.

1.2 Types and composition of kidney stone

A kidney stone is a hard mass developed from crystals that separate from the urine and build up on the inner surfaces of the kidney. Normally, urine contains chemicals that prevent the crystals from forming. These inhibitors do not seem to work for everyone, however, so some people form stones. If the crystals remain tiny enough, they will travel through the urinary tract and pass out of the body in the urine without being noticed.

Kidney stones may contain various combinations of chemicals. The most common type of stone contains calcium in combination with either oxalate or phosphate. These chemicals are part of a person's normal diet and make up important parts of the body, such as bones and muscles.

A less common type of stone is caused by infection in the urinary tract. This type of stone is called a struvite or infection stone. A bit less common is the uric acid stone. Cysteine stones are rare.

Urolithiasis is the medical term used to describe stones occurring in the urinary tract. Other frequently used analogous terms are urinary tract stone disorder and nephrolithiasis.
1.2.3 Etiology\textsuperscript{2,3}

Doctors do not always know what causes a stone to form. While certain foods may promote stone formation in people who are susceptible, scientists do not believe that eating any specific food causes stones to form in people who are not susceptible.

A person with a family history of kidney stones may be more likely to develop stones. Urinary tract infections, kidney disorders such as cystic kidney diseases, and metabolic disorders such as hyperparathyroidism are also linked to stone formation. In addition, more than 70\% of people with a rare hereditary disease called “renal tubular acidosis” develop kidney stones.

Cystinuria and hyperoxaluria are two other rare, inherited metabolic disorders that often cause kidney stones. In cystinuria there is too much of the amino acid cysteine, which does not dissolve in urine and is voided. This can lead to the formation of stones made of cysteine. In patients with hyperoxaluria, the body produces too much of the salt oxalate. When there is more oxalate that can be dissolved in the urine, the crystals settle out and form stones.

Gallstones and kidney stones are not related. They form in different areas of the body. If you have a gallstone, you are not necessarily more likely to develop kidney stones.

Hypercalciuria is inherited. It is the cause of stones in more than half of patients. Calcium is absorbed from food in excess and is lost into the urine. This high level of calcium in the urine causes crystals of calcium oxalate (CaOx) or calcium phosphate (CaPh) to form in kidneys or in the urinary tract.

Other causes of kidney stones are hyperuricosuria (a disorder of uric acid metabolism), gout, excess intake of vitamin D, and blockage of the urinary tract. Certain diuretics (water pills) or calcium-based antacids may increase the risk of forming kidney stones by increasing the amount of calcium in the urine.

CaOx stones may also form in people who have a chronic inflammation of the bowel or who have had an intestinal bypass operation, or ostomy surgery. As mentioned above, struvite stones can form in people who have had a urinary tract infection. People who take the protease inhibitor indinavir, a drug used to treat HIV infection and AIDS, are at risk of developing kidney stones.
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1.4 Current status in the Worldwide population

Presently, urolithiasis is the third most common disorder of the urinary tract, the others being frequently occurring urinary tract infections and benign prostatic hyperplasia\(^4\). The worldwide incidence of urolithiasis is quite high and in spite of tremendous advances in the field of medicine, there is no truly satisfactory drug for the treatment of renal calculi\(^5\).

Urolithiasis clearly is a significant problem when it is recognized that the incidence of this disease has been estimated to be between 1 to 12\(\%\). Racial differences exist, in that urolithiasis is three to four times more common in whites than in blacks. Also, the condition is approximately twice as common in males as in females. Urolithiasis imposes a significant burden on the nation’s economy and health care system in that the estimated annual nationwide cost has been estimated to exceed 70 million dollars. Most patients still have to undergo surgery to be rid of this painful disease. Hyperoxaluria is the main initiating factor for urolithiasis\(^6\). It is therefore important to gain an understanding of stone disease and the mechanism of stone formation, along with insights into patient evaluation, prevention and treatment\(^3\).