

## Chapter 9. Kidney Stone Disease

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### ABSTRACT

Kidney stones, also known as nephrolithiasis or urolithiasis, are hard crystalline deposits formed within the kidneys or urinary tract due to supersaturation of minerals like calcium, oxalate, uric acid, and phosphate. The condition affects 10–15% of men and 5–8% of women globally, with high recurrence rates. Stone formation is a multifactorial process influenced by dehydration, dietary habits, metabolic disorders, genetics, and environmental factors. Stones vary in type calcium oxalate, calcium phosphate, uric acid, struvite, and cystine each associated with distinct causes and urinary pH levels. Clinically, kidney stones manifest as severe flank pain, hematuria, nausea, and urinary obstruction. Diagnosis involves history-taking, urinalysis, blood tests, 24-hour urine studies, and imaging such as ultrasound or CT scans. Treatment depends on stone size and location, ranging from conservative measures and medical expulsive therapy to interventional procedures like ESWL, ureteroscopy, and PCNL. Preventive management focuses on adequate hydration, dietary modification, and correction of metabolic abnormalities. Home remedies, such as increased water intake, lemon juice, and coconut water, can aid small stone passage but require medical supervision. Untreated stones may lead to complications like obstruction, infection, and renal damage. The overall approach emphasizes early diagnosis, minimally invasive treatment, and long-term prevention to minimize recurrence and maintain kidney health.

**Keywords:** Kidney stone, Pathophysiology, Diagnosis, Treatment

### INTRODUCTION

Kidney stones, medically known as nephrolithiasis or urolithiasis, are hard crystalline masses formed within the kidneys or urinary tract as a result of supersaturation of certain minerals and salts in urine. These stones develop when the normal balance between solubility and precipitation of urinary salts is disturbed, leading to crystallization of compounds such as calcium, oxalate, uric acid, phosphate, and cystine. The condition is one of the most common disorders of the urinary tract and has affected humans since ancient times. Kidney stones can vary in size, ranging from microscopic crystals to large calculi that fill the entire renal pelvis, sometimes known as staghorn calculi. The disease occurs globally, affecting about 10–15% of men and 5–8% of women, with recurrence rates as high as 50% within ten years of the first episode. The formation of stones is multifactorial, influenced by genetic predisposition, dietary habits, lifestyle, environmental conditions, and metabolic disorders. Dehydration, excessive consumption of animal proteins, high sodium intake, obesity, and a sedentary lifestyle are among the major risk factors contributing to stone development. Geographical and climatic variations also play a role stone prevalence is higher in hot and arid regions due to increased fluid loss and concentrated urine.

Clinically, kidney stones are significant because they can cause excruciating flank pain known as renal colic, along with symptoms like nausea, vomiting, hematuria (blood in urine), and sometimes urinary tract infections. Although the condition is not always life-threatening,