

**С.Ж.АСФЕНДИЯРОВ АТЫНДАҒЫ
ҚАЗАҚ ҰЛТТЫҚ МЕДИЦИНА УНИВЕРСИТЕТІ**



**Kazakh National Medical University
named after S.D. Asfendiyarov**

Kidney stone disease

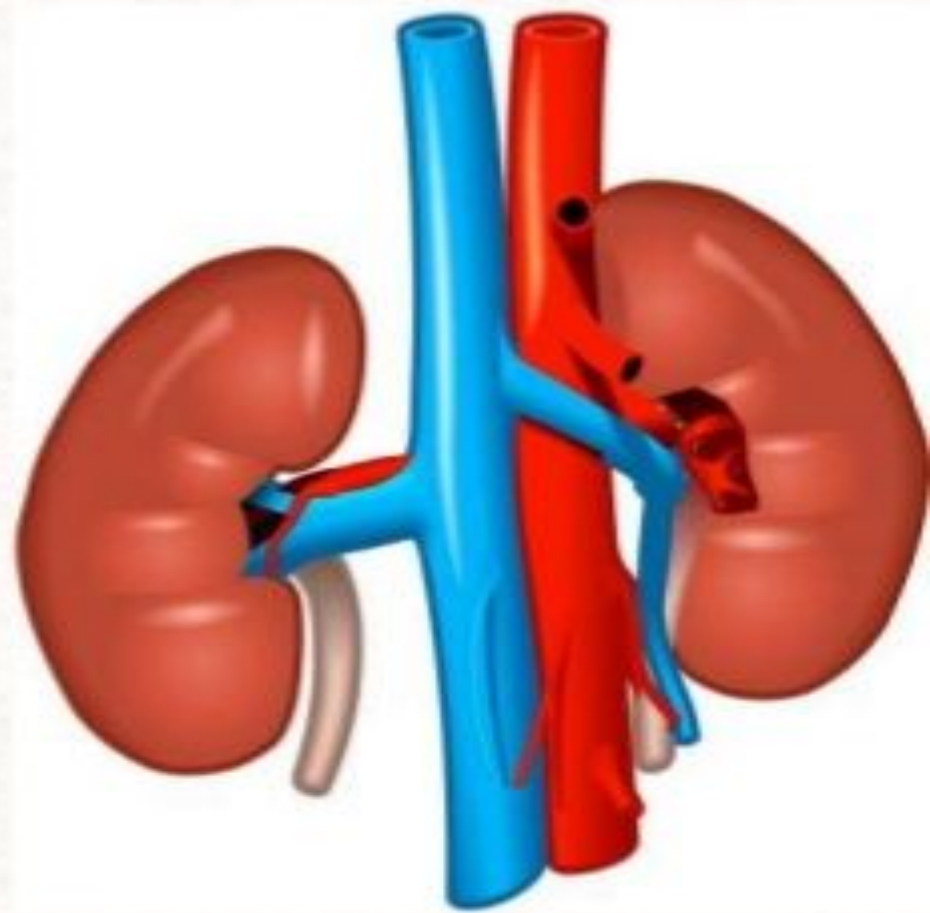
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OBJECTIVES

- **INTRODUCTION**
- **INCIDENCE**
- **STONE FORMATION**
- **TYPES OF STONES**
- **CLINICAL MANIFESTATIONS**
- **CAUSES & RISK FACTORS**
- **PATHOPHYSIOLOGY**
- **TREATMENT & PREVENTION**



INTRODUCTION

- Kidney Stones, also known as **renal calculus** or **nephrolith**, are small, hard deposits of mineral and acid salts on the inner surfaces of the kidneys.
- If stones grow to sufficient size they can cause blockage of the ureter.
- **kidney**----- stone (calcium)
gall bladder--- stone (cholesterol oxalates)
intestine ----- jejunum (hard substance)



INCIDENCE

- ✘ Urinary calculi are more common in men than in women.
- ✘ Incidence of urinary calculi peaks between the 3rd and 5th decades of life.
- ✘ 80% of stones under 2mm in size
- ✘ 90% of stones pass through the urinary system spontaneously
- ✘ There is seasonal variation with stone occurring more often in the summer months suspecting the role of dehydration in this process.



STONE FORMATION

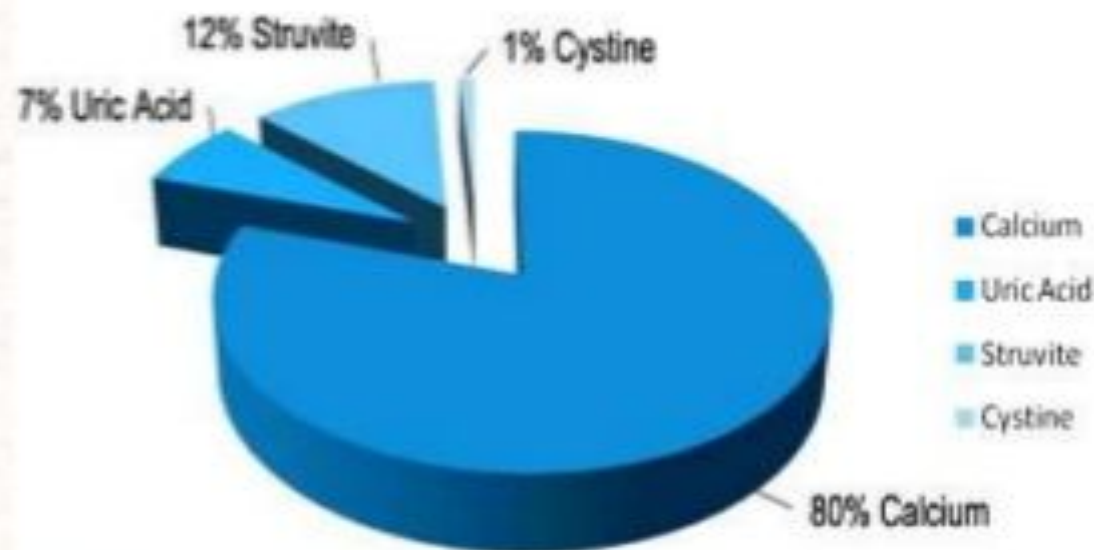
- Highly concentrated urine constituents crystallize and harden to form calculi.
- Kidney stones form when our urine contains more crystal-forming substances — such as calcium, oxalate and uric acid.
- At the same time, our urine may lack substances that prevent crystals from sticking together, creating an ideal environment for kidney stones to form.
- The crystals get deposited on the nucleus and continue to grow. These can some times adhere to the renal papillae.



TYPES OF KIDNEY STONES

- Calcium oxalate
- Calcium phosphate
- Struvite
- Uric acid
- Cystine

Percentage of Kidney Stone Types



Calcium Stone



Uric Acid Stone



Struvite Stones



Cystine Stone

- ❑ **Calcium stones:** Most kidney stones are calcium stones, usually in the form of calcium oxalate and calcium phosphate. Oxalate is a naturally occurring substance found in food. Some fruits and vegetables, as well as nuts and chocolate, have high oxalate levels. Our liver also produces oxalate.

CALCIUM PHOSPHATE



IN ALKALINE URINE



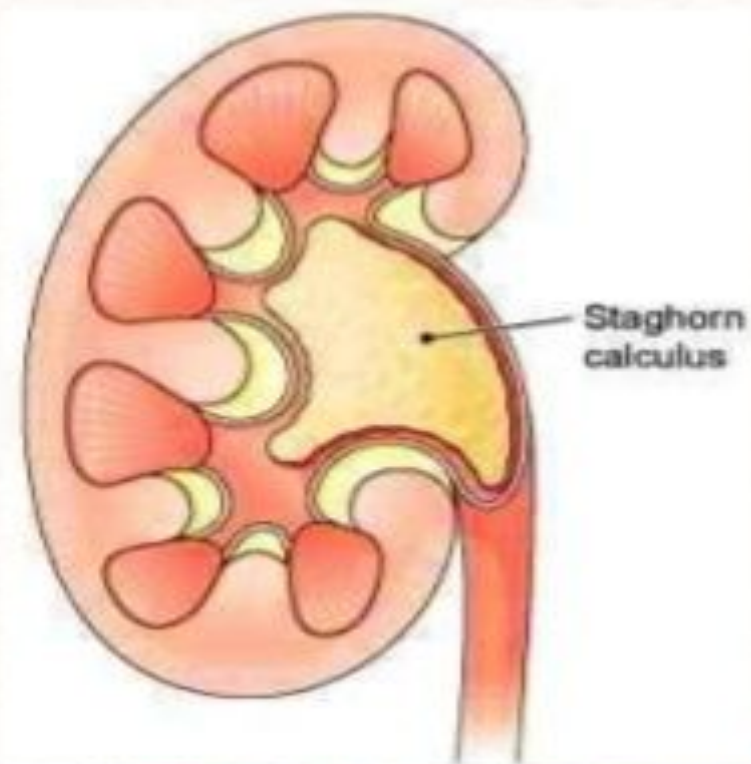
ENLARGES RAPIDLY



TAKE SHAPE OF CALYCES



STAGHORN →



- ❑ **Uric Acid:** This type of kidney stone is more common in men than in women. They can occur in people with gout or those going through chemotherapy.
- ❑ **Struvite:** This type of stone is found mostly in women with urinary tract infection. These stones can be quite large and cause urinary obstruction.
- ❑ **Cystine:** Cystine stones are rare. They occur in both men and women who have the genetic disorder cystinuria.
- ❑ **Other:** Other, rarer types of kidney stones also can occur. Such as *XANTHINE STONES, DIHYDROXY ADENINE STONE, SILICATE STONES* etc.

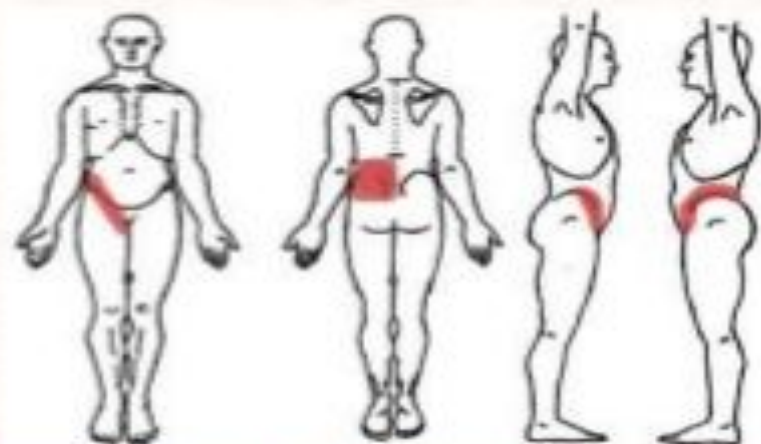
Classification ^[edit]

Kidney stones are typically classified by their location and chemical composition.

Kidney Stone type	Population	Circumstances	Color	Sensitivity	Details
Calcium oxalate	80%	when urine is acidic (decreased pH) ^[45]	Black/Dark brown	Radio-opaque	Some of the oxalate in urine is produced by the body. Calcium and oxalate in the diet play a part but are not the only factors that affect the formation of calcium oxalate stones. Dietary oxalate is an organic molecule found in many vegetables, fruits, and nuts. Calcium from bone may also play a role in kidney stone formation.
Calcium phosphate	5–10%	when urine is alkaline (high pH)	Dirty white	Radio-opaque	Tends to grow in alkaline urine especially when proteus are present.
Uric acid	5–10%	when urine is persistently acidic	Yellow/Reddish brown	Radiolucent	Diets rich in animal proteins and purines: substances found naturally in all food but especially in organ meats, fish, and shellfish.
Struvite	10–15%	infections in the kidney	Dirty white	Radio-opaque	Preventing struvite stones depends on staying infection-free. Diet has not been shown to affect struvite stone formation.
Cystine	1–2% ^[46]	rare genetic disorder	Pink/Yellow	Radio-opaque	Cystine, an amino acid (one of the building blocks of protein), leaks through the kidneys and into the urine to form crystals.
Xanthine ^[47]		Extremely rare	Brick red	Radio-opaque	

CLINICAL MANIFESTATIONS

- Severe flank pain
- Abdominal pain
- Nausea and vomiting
- Fatigue
- Elevated temperature, BP, and respirations
- Steady Pain
- Pain on urination; Pink, red or brown urine
- Oliguria and anuria in obstruction
- Hematuria
- Renal colic
- Hydronephrosis



CAUSES

- ❖ **Supersaturation of urine is the key to stone formation**
- ❖ **Imbalance of pH in urine**
- ❖ **Gout**
- ❖ **Hyperparathyroidism**
- ❖ **Inflammatory Bowel Disease**
- ❖ **UTI (Urinary Tract Infections)**
- ❖ **Dehydration**
- ❖ **Crystal aggregation**

Causes

- Drinking less water
- Wrong diet
- Laziness in urination
- Less consumption of Vit. A, C
- Excess hard work
- Urine disorder

RISK FACTORS

HIGH MINERAL CONTENT IN DRINKING WATER



DEHYDRATION



FAMILY OR PERSONAL HISTORY



DIETARY INTAKE

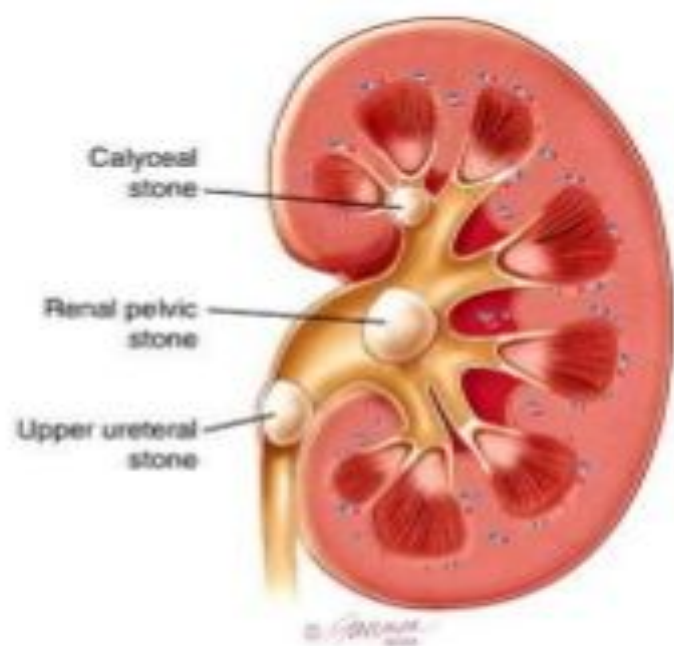


BEING OBESE

TREATMENT & PREVENTION

❖ Acute Treatment:

- ❖ Pain Medication!!
- ❖ Strain urine for stones
- ❖ Keep Hydrated
- ❖ Ambulation
- ❖ Diet Restrictions
- ❖ Emotional Support
- ❖ Invasive Procedure (may be necessary)



Surgical Procedures

- ❑ **Lithotripsy:** used sound wave to break up large stones into smaller fragments allowing it to pass through the urinary tract.
 - ❑ Extracorporeal Shock-Wave Lithotripsy (ESWL)
 - ❑ Percutaneous Ultrasonic
 - ❑ Electrohydraulic
 - ❑ Laser
- ❑ **Surgical Therapy**
 - ❑ Nephrolithotomy (Kidney)
 - ❑ Pyelolithotomy (Renal Pelvis)
 - ❑ Ureterolithotomy (Ureter)
- ❑ **Basket Extraction/Ureteroscopy**

PREVENTION

- **Hydration**
 - Drink 3 liters of fluid per day (14 cups)
 - Ideally water
 - Lemonade (citrate decrease stone formation)
- **Diet**
 - Low sodium & calcium intake.
 - Avoid intake of oxalate-containing foods (eg, spinach, strawberries, rhubarb, tea, peanuts, wheat bran).
 - Low protein intake is required.
- **Exercise/Increase Activity**
 - Avoid activities leading to sudden increases in environmental temperatures that may cause excessive sweating and dehydration.

MEDICATIONS

- ✓ Pain relief may require **narcotic medications**. The presence of infection requires treatment with antibiotics. Other medications include:
- ✓ **allopurinol for uric acid stones**
- ✓ **diuretics**
- ✓ **sodium bicarbonate or sodium citrate**
- ✓ **phosphorus solutions**



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