

**INTERNATIONAL JOURNAL OF UNIVERSAL
PHARMACY AND BIO SCIENCES**

IMPACT FACTOR 4.018***

ICV 6.16***

Pharmaceutical Sciences

Review Article.....!!!

AN OVERVIEW ON NEPHROLITHIASIS**S.ELIZABETH BENITA^{1*}, S.SUBA SREE¹, S.SRINIDHI¹ and SRIPADH
RAMACHANDRAN²**¹*Pharm D, 4th year, jaya college of pharmacy, Tamilnadu, India.²Biomedical engineering 2nd year, s.t. peters university, Tamilnadu, India.**ABSTRACT****KEYWORDS:**Kidney stone, Calcium oxalate,
Treatment.**FOR CORRESPONDENCE:****S.ELIZABETH BENITA*****ADDRESS:**Pharm D, 4th year, jaya college of
pharmacy, Tamilnadu, India.

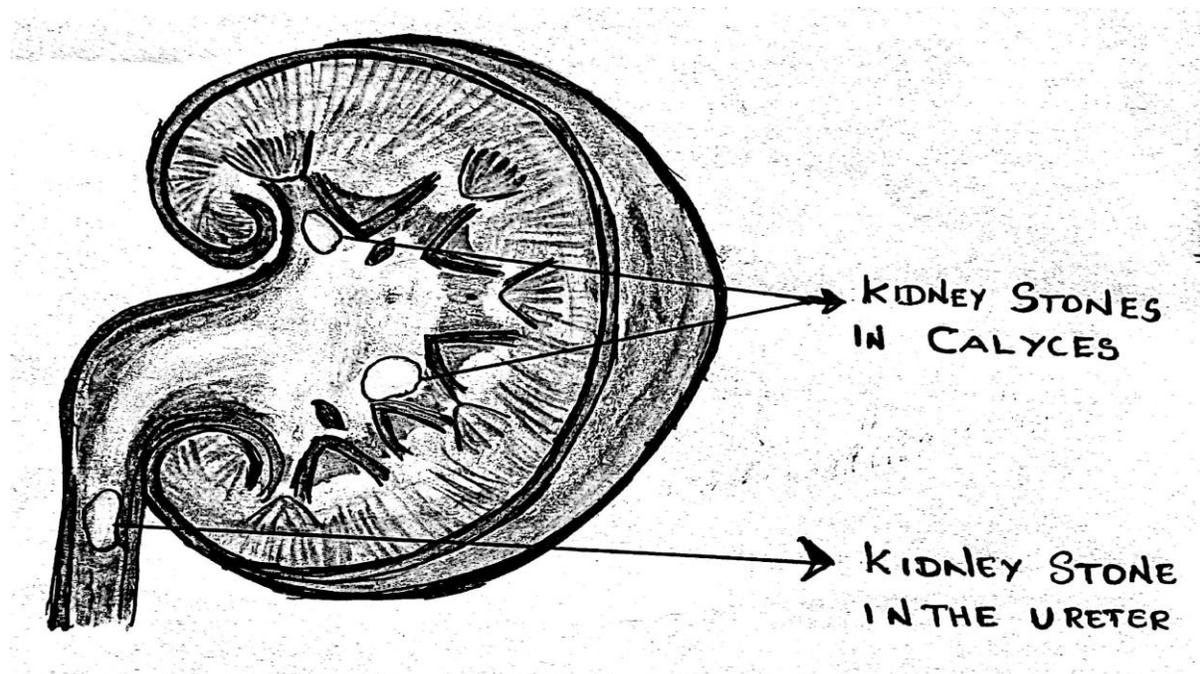
In the present review the clinical condition of nephrolithiasis have been discussed. It is made up of certain type of stones, commonly consists of calcium oxalate. Mostly found in both sexes in inner region of the kidney. Studies proves that, the prevalence of kidney stone occurs at the age of 20-50 years. Here discussed about the various diagnostic techniques, the prevention and types of kidney stones such as calcium oxalate, calcium phosphate, uric acid, cysteine, struvite stones were discussed. The people who are suffering from nephrolithiasis will have common symptoms such as pain, coloured urine, pain during urination, nausea and vomiting, urosepsis, fever and chills. The occurrence of kidney stones are as follows they are inadequate intake of water, obesity, environmental changes, nephrologically lithogenic, systematic factors, urinary tract infection were also discussed. here Also discussed about test and various diagnosis technique, such as intravenous pyelogram (VIP), percutaneous nephrostolithotomy (PNI). Rigid & flexible ureteroscopy (URS), blood testing, urine testing, CT imaging. Dietary & prevention includes, reduced alkaloid and caffeine consumption, proper intake of liquid intake, reduced intake of animal proteins. Most commonly used allopathic and ayurvedic and herbal medicatins were used.

INTRODUCTION:

Nephrolithiasis is the clinical condition in which there is a formation of stones in the urinary tract which results in the formation of kidney stone. It is a solid lump (like grains of sand or slightly larger in size) which is made up of calcium oxalate, uric acid, struvite, and cysteine. This is due to the precipitation of certain substance present in urine. These stones were build up in the inner surface of the kidney. In some cases it may cause pain this is due the blockage of stone in the ureter. Studies report that 5% of American women and 12% of men develop kidney stones. Some of the researches have proven that the peak ages for forming stones are 20 -50years of age.

The common symptoms are sever pain in the back, sudden spasms of excruciating pain, bloody, cloudy or smelly urine, illness, frequent urge to urinate or a burning sensation during urination, fever and chills.

The commonly followed diagnosis is urine analysis, X-rays image, intravenous program and ultrasound, recently introduced method is non-contrast helical computerized tomography. Currently crystallographic examination is less expensive methods. The most popular method followed now a days is Fourier transform infrared spectroscopy (FTIS) in which the information regarding the composition of the stone is obtained even to prevent the recurrence of kidney stone.

**Kidney stone:**

Kidney stones are hard, rock-like crystals of different shapes and size made up of minerals present in the urine. It occurs when salts in the urine precipitate and forms a solid materials.

TYPES OF KIDNEY STONES**➤ Calcium oxalate stone:**

It is common in about 80% of stones. It is the combination of calcium with oxalate or phosphate. They tend to form when the urine is acidic at lower level of pH in urine. In the condition of idiopathic hypercalciuria the level of calcium absorption is increased.

➤ Calcium phosphate stone:

They are less popular in population and are caused by the combination of high urine calcium and alkaline urine calcium, the urine has high pH. They were found in both sexes.

**Calcium Stone****➤ Uric acid stones:**

Accumulation of uric acid forms due to the intake of dietary animal rich protein because of its high purine content which leads to a condition known as hyperuricosuria. Uric acid stones form with two factors which include low excretion rate of urine, high level of serum uric acid. Uric acid is poorly soluble at pH of less than 5.5 and the solubility increases at a pH greater than 6.6.

**Uric Acid Stone****➤ Struvite stones:**

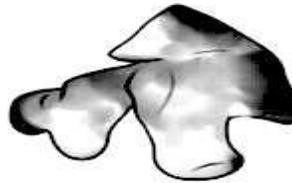
It is otherwise called as triple phosphate stone (or) infection stone. It is composed of magnesium, ammonia and phosphate. It occurs in pelvis and calyces only when the urinary tract is infected by a urea splitting bacteria particularly Proteus species. It tends to branch and enlarge and their growth is rapid. Struvite stone formation occurs only when ammonia production is increased and the urine pH is elevated, which decreases the solubility of phosphate. They fill the renal collecting systems and assume a “staghorn” configuration. The treatment for these struvite stones are chemotherapy, surgery.



Struvite Stones

➤ **Cysteine stones:**

They are large, bilateral and multiple stones. They are hereditary or genetic disorders of amino acid transport involving the intestinal epithelia and renal tubule cells. As a result of renal tubular transport disorder, large amount of cysteine is excreted in the urine. The stones begin to form in the first to fourteenth decades of life.



Cystine Stone

wikiHow

SYMPTOMS:

- ❖ Severe pain in the side and back, below the ribs.
- ❖ Pain that spreads to the lower abdomen and groin.
- ❖ Pain that comes in waves and fluctuates in intensity
- ❖ Pain on urination.
- ❖ Pink, red or brown urine
- ❖ Nausea and vomiting and sweating
- ❖ Cloudy or foul-smelling urine.
- ❖ Persistent need to urinate.
- ❖ Urinating more often than usual.
- ❖ Fever and chills if an infection present
- ❖ Urinating small amounts of urine.

- ❖ Typical symptoms of acute renal colic or intermittent colicky flank pain that may radiate to the lower abdomen or groin.
- ❖ Lower urinary tract symptoms such as dysuria urgency and frequency may occur once a stone enters the ureter.
- ❖ Presence of infection with urinary tract obstruction.
- ❖ Urosepsis.
- ❖ Obstruction in as solitary or transplanted kidney.
- ❖ Bilateral obstructing stones.
- ❖ The patient cannot find a comfortable position and often writhes or paces with pain.
- ❖ Reduced urinary excretion.
- ❖ White blood cells or puss in the urine.

CAUSES

Kidney stones are generally caused by the following factors:

- ❖ Inadequate intake of water.
- ❖ Increased level of obesity.
- ❖ Environmental changes.
- ❖ Rise in incidence of comorbidities such as diabetes mellitus and metabolic syndrome.
- ❖ Systemic, nephrological, mechanical change during the time of pregnancy creates an suitable environment for stone formation.
- ❖ Inadequate hydration.
- ❖ Few intake of calcium.
- ❖ Higher intake of animal protein.
- ❖ Increased intake of glucose and fructose.
- ❖ Lower levels of phytate in diet.
- ❖ Lack of stones inhibitors in urine.
- ❖ Rise in lithogenic factors accompanied by increased level of urinary citrate nephrocalcin, magnesium, glycosaminoglycans and uromodulin act as inhibitors stone function.
- ❖ Urinary tract infection.
- ❖ High intake of sodium, chronic diarrhoea.
- ❖ Excessive physical exercise.
- ❖ Gastric bypass surgery.
- ❖ Inflammatory bowel diseases that increase calcium absorption.

TEST AND DIAGNOSIS:

The following test can be rule out obstruction

- ❖ Abdominal x-ray
- ❖ Intravenous phyeogram(IVP)
- ❖ Retrograde phyeogram.
- ❖ Ultrasound of the kidney.
- ❖ MRI of the abdomen and kidneys.
- ❖ Abdominal CT scan.
- ❖ Percutaneous nephrostolithotomy (PNL).
- ❖ Rigid and flexible ureterorenoscopy (URS).
- ❖ Shock wave lithtripsy (SWL).

Blood testing:

Blood test reveals the presence of calcium or uric acid in the blood it helps in the monitoring of health of the kidney and may lead your doctor to check for other medical conditions.

Urine testing:

In this test the urine sample is collected for the regular interval of 24 hours in two consecutive days. This test will reveal the excretion of too many stones forming mineral or few stones preventing substance.

Imaging:

This method shows the presence of kidney stones in the urinary tract. The options range from simple abdominal x ray to very high expensive methods . Which miss small kidney stones, to high speed or dual energy.

Computerized tomography (CT) that may even reveal tinny stones

Other imaging options include an ultra sound, a noninvas test and intravenous urography which involves injecting dye into an arm vein and taking x-rays (intravenous phyeogram) or obtaining CT image (CT urogram) as the dye travels through the kidney and bladder.

Analysis of passed stones:

The person is asked to urinate frequently to catch stones that are passed along with it. The lab analysis will reveal the various type and constituent of the stones. The doctor further use these information to determine what type of stone is formed.

Most stones are treated without surgery. Mostly 90% of stones can be passed out in 3 to 6 weeks.

There are three minimal invasive techniques which significantly reduce the morbidity of stones .

They are mentioned below

Percutaneous nephrololithotomy (PNL).

Rigid and flexible ureterorenoscopy (URS).

Shock wave lithotripsy (SWL).

Trans vaginal ultra sounohraphy is also sometimes used to visualize a distal and establish dialation only to pelvic brim. T2-weighted half fourier single shot turbo spin echo (HASTE) magnetic resonance urography (MRU) were used for both pregnant and non-pregnant women who are suspected to nephrolithiasis.

DIETARY & PREVENTION:

Diet:

Diet can also inhibit the formation of stone. Diet is one of the several factors that inhibit kidney stone formation. A healthy diet helps in reducing the risk of kidney stone. A healthy diet includes:

Taking citrus fruits

Reducing salt intake

Prevention:

Drinking of water at least 2.5 litres (or)10 cups of fluid will dilute the stone forming substances, maling stones less likely to form.

Fresh fruit drinks are more recommended than surgery juices.

Different kinds of kidney stones required different prevention diets.

Dietary calcium binds in the intestinal lumen with dietary oxalate forming an insoluble, non-absorbable complex.

Avoid too muscle of tea & coffee consumption.

Excessive intake of animal protein, increases the glomerular filtration rate & this hyper filtration contributes to an increased urinary excretion of oxalate, calcium etc.

DIET AND KIDNEY STONES



Drugs:

S.No	Drugs	Category	Mechanism of action	Uses
1.	Amiloride (midamor)	Diuretics	Na ⁺ reabsorption in late distal tubule & collecting duct	Kidney diseases
2.	Allopurinol (lupurin, zyloprim)	Analogue of hypoxanthine.	It inhibits xanthine oxidase and prevent the synthesis of urate from hypoxanthine and xanthine	Urinary infections, calculi
3.	cholestyramine	Bile acid Sequestrates	Increasesin hepatic LDL receptors. Inhibition of reductase activity by a statin.	Kidney disease
4.	Digoxin (lanoxin)	Cardiac glycoside	Inhibition of sodium, potassium , ATPase.	Ailments of kidney diseases
5.	Etidronate disodium	Bisphosphonate	It prevent hydroxyl apatite dissolution	Kidney stones
6.	indinavir	Peptidomimetichydrox yethyleneHIV inhibitors	It reversed binds to the active site of HIV protease, prevent polypeptides processing.	HIV diseases, kidney diseases.
7.	zonisamide	Sulphonamide derivatives	It inhibits the T-type Ca ⁺ channel, repetitive firing of spinal cords neurons.	Ailments of stone diseases

Ayurveda & herbal drugs:

Couch grass rhizome (*Elymusrepens*): This drug is a soothing diuretic that can be useful as part of a formula to make passing stone easier.

Golden rob hub (*Solidago spp.*): This drug cause the stone to vanish, the patients never noticed the stone passing & upon a follow up ultra sound, they had disappeared.

Horse chestnut seed(*Aesculushippocastanum*): throbbing pain with edema& inflammation. Often used for haemorrhoids, varicose veins & trauma injuries.

Horsetail herb (*Equisetum arvense*): it is a drug which helps in healing minor kidney damage of hematuria caused by stones.

Hydrangea root bark (*Hydrangea arborcens*): This type of drug helps in urinary tract analgesics, indicated for genito- urinary tract pain & spam.

Jin qiaucoa herb (*Desmodiumstyracifolium*): it is more effective for helping to pass kidney stone also in the treatment of gall stones. Commonly used in formulas for helping to pass kidney stone.

Kava roots (*Piper methysticum*): it is a drug which is used for urinary tract pain, relax the ureters, allowing stones to pass more easily & diminishes colicky, spasmodiac pain.

Pellitory of the wall herb (*Parietaria diffusa*): This is a drug which is used as a diuretic, kidney trophorestorative and to help pass urinary calculi stones. It is often combined with Goldenrod, parsley or parsley piert to help prevent stones or assist in their passage.

Punarnava herb (*Boerhaavia diffusa*): This is common Indian weed used as a kidney restorative and to help expel kidney stones , it can also inhibit formation of struvite stones.

Varuna bark (*Crateavanurvala*): This ayurvedic herb is used to help prevent kidney stones and is also used with banana stem for successfully treating kidney stones. In recent human studies the author state that this formula “**helped to dissolve renal calculi, facilitated their passage and reduced pain**”.

Khella seed (*Ammi visnaga*): This northern Africa plant is an effective antispasmodic, useful for releiving spasm and pain in the urinary tract, gall bladder, respiratory tract and cardiovascular system. Khella is very useful as part of a protocol for helping to pass urinary calculi.

Lobelia seed / fresh herb (*Lobelia inflata*): This is primarily known as a respiratory remedy used for asthma and spasmodic coughs. It is also an effective antispasmodic.

Wild carrot seed (*Daucus carota*): This herbal drug along with parsley piert (*alchemillaarvensis*) for helping to expel kidney stones.

Yucca root (Yucca spp.) This herbal drug used to help ease passage of kidney stones and relieve urinary tract pain.

CONCLUSION:

In this summary the formation of kidney stones and their types, occurs due to the accumulation of certain substances were discussed. Calcium oxalate and calcium phosphate are the common stones occur in both the sexes. Reports says that men is affected much than women less Water consumption is the main reason and consumables like peanut, potato strawberry and intake of pomegranate seeds in kidney too causes kidney stone. Lifestyle strains and stresses are a big cause of kidney stone formation, combined with chronic dehydration. It is important to monitor blood and urine calcium levels in people with kidney stone. Both the sexes are affected equally. They are monitored regularly by CT Scan, Lithotripsy therapy, percutaneous nephrolithotomy, Ultrasound procedures, the diagnostic techniques such as blood testing and Urine testing are followed regularly. Common drugs such as Allopurinol, Digoxin were widely administrated. Not only allopathic drugs, ayurvedic drugs place an important role in the modern world treatment. Common dietary measures such as increased intake of fluids, reduced intake of salt, decreased consumption of alcohol, reduced intake of sugar level were prescribed for the patients suffering from Nephrolithiasis.

REFERENCES:

1. David Winston, RH(AHG), Herbal & Nutritional treatment of kidney stones volume 10(2) Journal of American Herblests guild ;61-71
2. Choubey Ankuretal, Potential of medicinal plants in kidneys gall and urinary stones, Internatioal journal of drug development & Research, April – June 2010, vol 2(2):431-447
3. Darwin dennison, Victor E Abraham, The development of Kidney stone dietary plans for patient education. International electronic journal of health education, 2011,14 150-156
4. Sandayetal, Kidney stones disease: Etiology& Evaluation international journal of applied biology & pharmaceutical technology. May-July 2010 Vol(1):175-182
5. Doss F, Kidney stone, Samoa Medical Journal
6. Fedric L Col, Joan H Parks, John R A splin, The pathogenis & treatment of kidney stones . The new England journal of medicine 1992, vol327(16):1141-1152

7. Michelle J semins, Brain R Matlaga, Kidney stone during pregnancy, Nature reviews urology, March 2014 vol 11: 163-168
8. Murat Dursum, alperotunctimur, EmunOzbek, Kidney stones of ceftriaxone european medical journal. January 2015:68-74
9. KK Malhotra medical aspects of renal stones journal, Indian academy of clinical medicine. October –December 2008 vol 9(4):82-286
10. Pawankumar, sanjita das, to study the biochemical analysis of kidney stones by using FTIR spectroscopy in the patients with renal calculosis, Research and review: Journal of pharmaceutical analysis. October –December 2013 Vol 2(4):27-32
11. Mark Thomas, Clinical diagnosis of kidney stones, Journal Compilation. 2007 asian pacific society of nephrology 2007 (12):81-83
12. Charles D scalestal, prevalence of kidney stones in the united states, European association of urology, 2012 (62):160-165
13. Victoriano Romero, Halukakpinar, Dean G Assimos, Kidney stones: a global picture of prevalence, incidence of associated risk factors, reviews in urology 2010 vol 12(2/3) e86-e95.
14. Holdgate A, Pollock T Nonsteroidal anti-inflammatory drugs (NSAIDs) versus for acute renal colic. Cochrane Database Syst Rev 2004;
15. Moe OW. Kidney stones: Pathophysiology and medical management. Lancet 2006;367:333-44[crossref][ISI][Medline]
16. Channa NA, Ghangro AB, Soormo AM. Et al. Analysis of kidney stone by using FTIR spectroscopy. Am J Physiol Renal Physiol. 2007;35:1228-38
17. Busby JE, Low RK. Ureteroscopic treatment of renal calculi. UroClin North Am. 2004;1:89-98
18. Taylor EN, Stampfer MJ, Curhan GC. Diabetes mellitus and the risk of nephrolithiasis. Kidney Int 2005;68:1230-5
19. Kerstetter J Caballero B, O'Brien K, Wurtman R, Allen L Mineral homeostasis in obesity : effects of euglycemic hyperinsulinemia .
20. Saigal CS, Joyce G, Timilsina AR. Direct and indirect costs of nephrolithiasis in an employed population: opportunity for disease management: Kidney Int 2006;68:1808-14

21. Pearle MS, Roehrborn CG, Pak CY. Meta analysis of randomized trials for medical prevention of calcium oxalate nephrolithiasis K Endourol 1999;679-85
22. Qjang W, Ke X, Water for preventing urinary calculi. Cochrane Database syst rev 2004; CD004292.