WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 12, Issue 6, 71-90. Review Article ISSN 2277– 7105

A BRIEF REVIEW ON KIDNEY STONE, HERBAL PLANTS USED FOR KIDNEY STONE ALONG WITH THEIR PHARMACOLOGICAL ACTION AND THEIR MARKETED PRODUCTS

Omkar Atre[1]*, Sanjay Bhawar[2] and Kavita Dhamak[3]

[1,3]Department of Quality Assurance Technology, Pravara Rural College of Pharmacy, Dist. Ahmednagar (Maharashtra) 423107 India.

[2]Department of Pharmacology, Pravara Rural College Of Pharmacy, Dist. Ahmednagar (Maharashtra) 423107 India.

Article Received on
26 Feb. 2023,

Revised on 18 March 2023,
Accepted on 08 April 2023

DOI: 10.20959/wjpr20236-27486

***Corresponding Author**
Omkar Atre
Department of Quality Assurance Technology, Pravara Rural College of Pharmacy, Dist. Ahmednagar (Maharashtra) 423107 India.

ABSTRACT

Use of herbal plants have for treatment of kidney stone is gaining interest as the effectiveness is seen to much extent by various phytoconstituents present in them. Kidney stone are of calcium oxalate, calcium phosphate, uric acid and struvite type. Urine formation and its volume plans and important step for removal of kidney stone. The mechanism for stone formation involves three steps crystal nucleation, crystal growth and crystal aggregation. Kidney stone have been diagnosed by three examination such as X-ray, ultrasound and urine and blood analysis. The herbal drugs have shown to act by different mechanism proving different pathophysiological condition to the body. Surgical operation such as Shock Wave Lithotripsy (SWL) and Ureteroscopy (URS) are used for the condition in which the passage of the stone has stopped and leading to severe pain. Many herbal products are also been marketed for the treatment of kidney stone in India. This review represents comprehensive account of formation of renal stone, its types and herbal marketed products that are used for treatment of kidney stone.

KEYWORDS: Supersaturation, Antilithiatic, Hyperoxaluria, Bowman's capsules etc.

INTRODUCTION

Kidney stone is a small pebble like pieces formed from mineral or salts in the one or both kidneys. The crystal formation is generally due to the physiochemical changes in the renal

functioning leading to the formation of the crystals by supersaturation, nucleation, growth, aggregation and retention mechanism. The most commonly associated stone formed are calcium oxalate which is mainly formed at the renal papillary surfaces. This formation of crystal is also called as urolithiasis. Among the total human population on the earth 12% of the population is affected yearly with kidney stone. The incidence is found mostly between the age group of 20-50years. Also, the percentage associated with the formation of the crystal may increase up 50% due to global warming.[1] The contraindications associated with the disease is more as its final impact is renal failure. As per studies the men have a greater number of stone formation as compared to the women. The mechanism that favours the crystal formation is generally due to the imbalance between the mineral ion concentrations. Among the observed cases the most common found stone are calcium oxalate and magnesium phosphate type. The calcium oxalate is found in two forms i.e., monohydrate and dihydrate. Also, additionally uric acid and cystine are also found. Kidney stone is mostly associated with the diseases such as type 2 diabetes mellitus, hypertension, blood pressure, in some of the cases with the arthritis and obesity. The phenomenon is generally associated with p38 nitrogen activated protein kinase pathways due to activation of apoptosis in renal epithelial cells when reacting with oxalate ions. The recurrence of the stone is always seen in the patients undergoing the surgery. Hence no perfect treatment is found till date. Herbal medicine has been constantly used in this treatment as many plants have been shown to provide anti-urolithiasis activity individually. Among this pashanbhed have been providing the significant activity. This herbal plant and its products have been decreasing the recurrence rate of the stone formation. Ayurveda has always a great advantage since ancient time for humans as well as animals on the earth. Basma churn etc have been totally practised for the source of formulation as means of ayurveda. Among the total known plants many offer advantage for treatment for kidney stones. Pashanbheda is a broad class of plant species which are been cultivated all over the country which act as major source for the treatment of kidney stone. The basic activities are antiurolethiatic and diuretic activity which are performed by pashanbhed. Many mechanisms take place for herbal drugs which reduces the effect of hepatotoxicity. The plants produce the effect via following mechanism such as[8]

A. Inhibition of ACE and Phospholipase A2 Enzymes
B. Improvement of renal functioning.
C. Prevention of recurrence of renal calculus via means of regulation of crystalloidcolloid.
D. Antioxidant activity i e improvement in renal tissue functioning.
E. Improvement in symptoms of urinary calculus such as haematuria, pain, micturition and

pain.

F. The oxalate mechanism is also regulated by herbal plant constituents.
G. Lithotriptic activity is produced.
H. Crystallization inhibition activity.
I. Exerts Antimicrobial activity against harmful and causative microorganism present in body and majorly on kidney environment.

Formation of urine

The formation of urine involves three major processes. The first is glomerular filtration, which take place in the renal corpuscles. The second and third are tubular reabsorption and tubular secretion, which take place in the renal tubules.

Glomerular filtration

Filtration generally involves removal of you may recall that filtration is a process in which blood pressure forces plasma and dissolved material outside the capillaries. During glomerular filtration blood pressure forces plasma, dissolved substances and small proteins from the glomeruli and into Bowman's capsules. This fluid is no longer plasma, but is called renal fluid filter. Comparison of glomerular blood pressure with that in other capillaries, it is quite high, approx. 60mmHg. The pressure in Bowman's capsule is very high low and its inner, podocyte layer is very permeable, so that approximately 20% to 25% of the blood that it enters the glomeruli and becomes the renal filtrate in Bowman's capsule. Blood cells and larger proteins are also large to be pushed out of the glomeruli so they remain in the blood. Waste products dissolve in the blood plasma, so they pass into the renal filtrate. Useful substances such as nutrients and minerals are also dissolved in plasma and are also present in the renal filtrate. Filtering is not selective with respect to usefulness; it it is selective only with respect to size. Therefore, renal the filtrate is very similar to blood plasma except that there is much less protein and no blood cells are present.

Tubular reabsorption

Tubular reabsorption involves reabsorption of most of the ions which leads to about 99% of reabsorption. Whenever we consider the volume of urine is about 1 L then the number of Na^+ & K^+ is also less due to reabsorption. The filtrate after the glomerular filtration is then passes to the urine which is just about total of 1%. The proximal convoluted tubule involves large no of the reabsorption due to the high pore size which provide easy passage into the blood again.

Mechanism of reabsorption

Active transport Passive transport Osmosis Pinocytosis.

Tubular secretion

This mechanism also changes the composition of urine. In tubular secretion, substances are actively secreted from the blood in the peritubular capillaries into the filtrate in the renal tubules. Waste products, such as ammonia and some creatinine, and the metabolic products of medications may be secreted into the filtrate to be eliminated in urine. Hydrogen ions (H^+) may be secreted by the tubule cells to help maintain the normal pH of blood.

Types of kidney stones

Calcium stones[4]

The most commonly found stone are of the calcium oxalate or phosphate. In terms of percentage the vast population is shown to have 50%-55% of the calcium oxalate stones, 5-10% of the calcium phosphate stone and severe cases may have 40-45% of the mixed form of stone of calcium oxalate and calcium phosphate in combination. The heterogenous solution that leads to formation of the nuclei and crystal growth is brushite (calcium hydrogen phosphate) or hydroxyapatite that is majorly present in calcium renal stone. The calcium stone are seen in hydrated form such as monohydrate or dihydrate forms having the composition of CaC2O4·H2O and CaC2O4·2H2O respectively. The combination of these two compositions is also seen for the female population above 45 years leading to 55-60% of the cases. Many factors contribute to CaOx stone formation such as hypercalciuria[2] (resorptive, renal leak, absorptive, and metabolic diseases), hyperuricosuria, hyperoxaluria, hypocitraturia, hypomagnesuria, and hyper cystinuria. The calcium oxalate monohydrate form is more charged have surface free energy more leading to formation of the stable stone structure than dihydrated form. The recurrence rate for these types of stone is more than other stone even after the surgical procedure is performed.

Fig. 1: CaOx Monohydrate renal stone (Foundation, 2020).

Struvite or magnesium ammonium phosphate stones[4]

The basic cause for the formation of the struvite or magnesium stone is urinary tract infection (UTI) which is mostly responsible for making the xpH more alkaline which initiated the formation of this type of stones. The pathogens species such as Proteus mirabilis, Klebsiella pneumonia, Enterobacter and Pseudomonas species have been found to be major cause for this type. Urease involves the major function of converting the urea into ammonia and carbon dioxide which make the urine to the pH of less than 7. Whenever the UTI is seen in the patients then role of the urease is been inhibited to certain amount leading to make urine more alkaline forming Struvite stones. The phosphate ions leading to the formation of insoluble complex leads to the deposition of more phosphate ions due to the insolubility in urine pH. Hence the magnesium, ammonium ions deposition over phosphate ions forms stones. The frequency and amount are seen mostly in female patient than in male.

Fig. 2: Struvite stone (Foundation, 2020).

Uric acid stones or urate[4]

Approximately 5 % of population is affected every year with this type of stones. The stone is totally diet based in which the percent of purine is more. Meat and fish are prime source for uric acid stones. High purine diet results in hyperuricosuria and decrease in urine pH and volume. The most common stone are found in men than female. The disease condition such as arthritis and hyperuricemia may lead to form urate stone.[5]

Cystine stones[4]

Whenever the presence of cystine is seen in urea it leads to cystinuria which is mainly responsible for cystine stones. Prime locations for this type of stone is bladder region. It is impossible to cure such stone.

Fig. 3: Cystine stone (Foundation, 2020).

Drug-Induced stones

Drug-induced stones leads to about 1-2% of all renal calculi stones. The stone formation is totally depended on the drug such as triamterene and glafenine, indinavir, triamterene, sulfonamides, indinavir and atazanavir. Majorly the protease inhibitors have been acting a stone forming agents. The factors that may lead to the drug induced stones are family history of urolithiasis, hypercalciuria, UTI, acidic or alkaline urine and hyperuricosuria. Guaifenesin Two main subtypes of drug-induced calculi exist with two mechanism such as

1. Metabolically-induced calculi
2. Drug-containing calculi

Mechanism of action renal stone formation

Kidney stone formation is a complicated process which is mostly used to increase in concentration in urine i.e., urinary supersaturation also some physiochemical changes occur leading to the phenomenon of the urinary stone formation. Supersaturation leads to the formation of the crystalline structure of calcium oxalate, calcium phosphate or uric acid stone. Supersaturation is thus a phenomenon that involves three basic steps the first is solubility level where the amount is solute is made solubilize at a particular concentration. The next step involves the addition of the addition of solute till the saturation level is reached. And the final step that involves the formation of supersaturation level was at particular point the addition of solute does not solubilize and crystal formation take place. This same mechanism occurs for kidney stone due to excess deposition of the calcium or uric acid in kidney. Then process is completely biological process initiated in the kidney or in ureters. When salt is added per solvent dissolves in the solvent until a specific concentration is reached, after which no further dissolution occurs is possible. At this point the solvent is said to be saturated with salt. If more salt is added, it crystallizes in solution, provided the temperature and pH do not change. The concentration at which saturation and crystallization are achieved begins is called the thermodynamic solubility product. If the crystallization

inhibitors would not be able to act, final. The result will be nephrolithiasis. The risk factor is mainly the rise in the constituents of calcium, phosphorus, uric acid, oxalate, cystine and low urine volume which ultimately causes increased in amount of kidney stone even after the surgical procedure is performed. The process is completely depended upon the thermodynamics and kinetics. As the process is completely pH dependent that mostly leads to the formation of the stone. crystallization begin which leads is called the thermodynamic solubility product. The stone formation generally consists of stone crystals formed by the process of nuclei formation, nucleation, aggregation. After the final step of aggregation, the nuclei stay in urinary system which leads to increased deposition of the crystals forming the more solid surface and increase in size crystals. The matured stone for ed is called as clinical stone (Renal calculus). Thus, whenever the antilithiatic component is used it acts on thus pH dependent caliculus. Constituents of stone components may differ, but the severity it causes may vary based on its site, severity of stone formation and its action at site. Since the stone composition may vary with the factor of the urinary inhibitors and promoters of crystallization the mechanism remains the same for event occurring for stone formation. The process of crystallization occurs when there is less concentration of the inhibitor in urine which leads to formation of the calcium phosphate or oxalate crystals in urinary system. Uric acid increases the solubility of the calcium oxalate hence making its concentration more leading to formation of the uric acid stone. The basic steps that lead to increase in urinary stone process are nucleation, growth, aggregation, and retention of crystals within the kidneys.

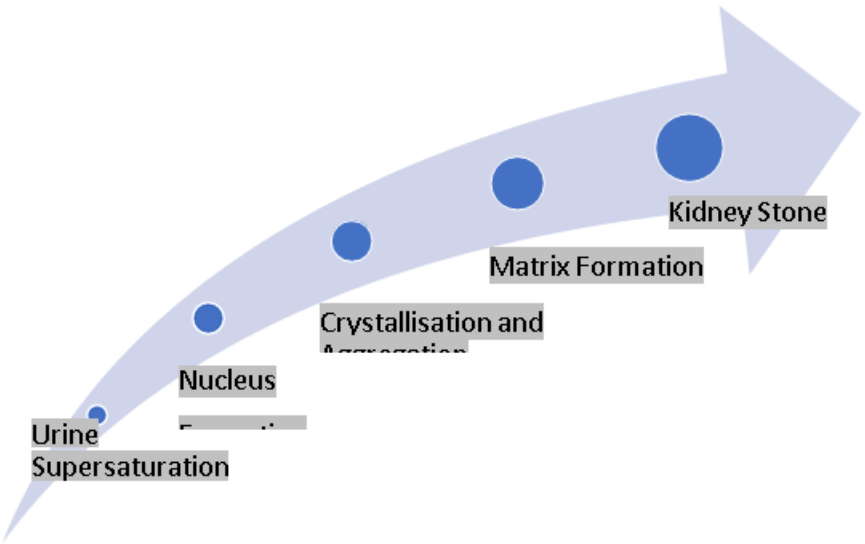

Fig. 4: Mechanism of kidney stone formation.

Steps for stone Formation[9,10]

A. Crystal Nucleation

B. Crystal Growth

C. Crystal Aggregation

D. Crystal-Cell Interaction

A. Crystal nucleation

The process involves the formation of liquid to solid state to form a supersaturated solution. This process is called as nucleation. The salts (calcium or uric acid) acts with the urine solution till the saturation phase is reached. The process involves the formation of loose clusters which have a tendency to increase the size of the stonewith particle formation via attractive forces. In a supersaturated liquid, free atoms, ions, or molecules start forming microscopic clusters that precipitate. Nuclei have a lattice like pattern which have the tendency to make it insoluble in solution. Epithelial cells, urinary casts, RBCs, and other crystals can act as nucleating centres in urine. Thus, the favourable condition for nucleation process is heterogenous existing external surfaces that trigger the nucleation process. When the nucleation process starts the driving force for n pressure increase the rate of reaction. In case of any cell injury is caused to the renal then this heterogenous factors are initiated more leadingto the formation of nucleation process. Cellular degradation process is seen in in vivo studies of rat associated with hyperoxaluria.

B. Crystal growth

After the formation of the nuclei the supersaturation leads to the crystal growth, this decreases the free energy associated with the molecules that leads the crystal formation. The proteins present in the human urine is generally responsible for the crystal growth and aggregation. The human serum albumin, retinol binding protein, transferrin, Tamm-Horsfall glycoprotein, and prothrombin are involved in this criterion for the formation of crystal growth. the increase rate of CaOx crystals is low and the transit time is low tubular fluid through the kidneys are only for some mins, it turned into calculated that the possibility of particles reaching a pathophysiological relevant length the crystal boom manner itself is extraordinarily low even though boom takes place at an uninhibited price of 2 mm according to minute distributed inhibitory effect of fibronectin (FN). within the extracellular matrix and frame fluids, on CaOx crystal growth is small thinking about the same old amount excluded.

C. Aggregation

The process in which crystals in the kidney sticks to the larger sized crystals is known a aggregation. Some researchers have proposed this crystal aggregation is the most essential step in stone formation. even though crystal growth is important step in CaOx kidneys stone formation, the method is so gradual that crystals cannot be big enough to hinder the renal tubules and to be held there simplest through this mechanism as a couple of minutes are wished for tubular fluid to skip via the kidneys. For that reason, the crystal is taken into consideration the extra crucial step aggregation. All CaOx fashions of urolithiasis admit this crystal aggregation is in all likelihood concerned in crystal retention inside the kidney due to the fact crystal aggregation may have full-size impact on particle length and aggregated crystals are typically determined in urine and kidney stones. Crystal aggregation is supported by using viscous coupling, this means that crystal-foreign compounds with a couple of binding sites, e.g. because the abnormally self-aggregating Tamm-Horsfall glycoprotein or other macromolecules, connect to crystal surfaces and act as form of glue.

D. Crystal-Cell Interaction

Crystal-cell mechanisms interactions are considered very complicated and a lot of them remain unexplored. Crystallization is brought on state of urinary supersaturation. Then crystals which formed to attach to the renal tubular epithelial cells and are taken into them. The process of attachment or endocytosis what's normally notion of is the proportion of crystals to renal tubular cells by using crystal-mobile interactions. Those structural and purposeful research of crystal-cellular interactions in culture advocate this COM crystals quickly adhere to microvilli on the cell surface and are eventually internalized. Khan et al. concluded that the crystal-mobile interaction is an essential element inside the development of urinary stone disease. There can be crystal-cell interactions between them the earliest tactics in the formation of kidney stones. Finlayson and Reid assumed this became unlikely that CaOx crystals could develop so massive that they may be sustained inside the renal tubules and this attachment of crystals became necessary to provoke stone formation. They have there have been many reports of the crystal being attached. Animal version and tissue way of life studies supplied evidence for crystals retention inside the kidney through attachment of the torenal epithelium cells. Kok and Khan determined the attachment of the crystal to the comb border of proximal tubules in rats. Experimental induction CaOx urolithiasis starts off evolved with hyperoxaluria observed via crystalluria and deposition in the kidneys. Some macromolecules in urine have an inhibitory effect on CaOx crystal

attachment. Lieske et al. suggested that diverse polyanionic mols within the urine, consisting of particular glycosaminoglycans, glycoproteins and citrate blockbinding of COM crystals to the cell membrane. One commonplace Function of molecules which they inhibit the adhesion of COM crystals to cells is their polyanionic character. They referred to that although polyanions are present within the tubular fluid it could envelop the crystals and thereby inhibit them adhesion to tubular cells, a distinct and separate set of signals they act on cells to modify their reaction to the crystals that do this tie.

Kidney stone composition

The composition of urinary stones consists of two levels of stone natural cloth (matrix). the natural matrix of urinary stones is composed of macromolecules which include glycosaminoglycans (GAGs), lipids, carbohydrates, and proteins. these molecules play a large role through selling or inhibiting the methods of kidney stone improvement. the principal components of the stone matrix are proteins (64%), non-amino sugars (nine.6%), hexosamine as glucosamine (5%), water (10%) and inorganic ash (10.4%). the matrix acts as a template worried within the assembly of kidney stones. The matrix of all stones includes phospholipids (8.6%) of the overall quantity of lipids, which in turn represents about 10. 3% of the stone matrix. Cell membrane phospholipids as part of the natural matrix guide the formation of calcium oxalate and calcium phosphate stones. Albumin is the primary element of the matrix of all styles of stones. Brushite stone is a difficult phosphate mineral of growing incidence, and a quarter of calcium phosphate (CaP) patients develop brushite-containing stones. within the urinary tract, CaP may be present inside the form of hydroxyapatite, apatite carbonate, or brushite (calcium mono hydrogen phosphate dihydrate, $CaHPO_4 \cdot 2H_2O$). Brushite is immune to surprise wave remedy and ultrasonic lithotripsy. While the majority loose energy of the cluster is much less than the strength of the liquid. For instance, charged soluble molecules which includes calcium and oxalate integrate to shape calcium oxalate crystals and turn out to be insoluble. Nucleation can be it is fashioned inside the kidneys through the mechanism of unfastened or solid particles. In supersaturated answers, if the quantity of promoters exceeds inhibitory promoters, nucleation will begin. As soon as the centre is created (and/or if it is docked) crystallization can occur at a lower chemical stress than is wanted to form the initial nucleus. Existing epithelial cells, urine casts, purple blood cells, and other crystals within the urine can act as nucleation centres in a nucleation procedure known as heterogeneous nucleation. The mucopolysaccharide natural matrix acts asa binder by using growing the nucleation and aggregation of heterogeneous crystals. On the

other hand, nanobacteria are claimed to form apatite systems serving as a crystallization middle for stone formation. Pyelography and ultrasound are options for real time targeting of radiolucent stones during SWL.[1] The whole manner potentiates the formation of stones. the position of oxalate-degrading microorganism including Oxalobacter formigenes in CaOx stone formation is currently under research. hence, treatment that makes a speciality of the system of nucleation intervention is one of the excellent strategies to controlling kidney stones.

Some common causes for kidney stone formation

1. Low urine volume
2. Dehydration
3. Diet
4. Bowel conditions
5. Obesity
6. Medical conditions
7. Medication
8. Family history

Low urine volume

Urine volume is important term associated with the kidney stone as it involves the flushing mechanism in the kidney for unwanted debris and material present in the kidney after glomerulus filtration is performed. Thus, more the urine volume the more is force and flushing phenomenon of the ions through the kidney. The major factor that leads to kidney stone is having low urine volume which is specially seen during the winter season. The decrease in the urine volume may be due to release of body fluid via dehydration means or via sweat means which leads to excess loss of the ions. To diagnose this the urine colour can be analysed which turns dark yellow in colour indicating that the amount of water is less to dissolve the ions leading to excess concentration. Hence to overcome this an average intake of water should be increased to max amount so that the risk associated with the stone formation is reduced. Average of 5 liters of water intake should be done for proper balancing the renal functioning.

Diet

Diet is an important factor as the majority of diet contains varying amount of the concentration of essential nutrients in it. Calcium oxalate crystals have a prime composition

of the calcium; hence diet rich are calcium should be avoided for deposition of calcium over the renal parts. The optimum concentration is necessary for the formation of the bone as well as for releasing it via body. Thus, lowering the concentration of diet may also lead to some serious bone disorders and thus a balanced diet of calcium is necessary to be consumed by an individual. The high salt rich diet is associated with CaOx stone formation. Hence lowering the amount of salts can also reduce the risk of stone formation. The diet that contains high amount of oxalate such as fish, chicken, animal protein needs to be avoided. The high amount of purine containing diet also need to be avoided.

Bowel conditions

The disease condition such as ulcerative colitis or Crohn's disease leads to diarrhoea which is a bowel disorder. The diarrhoea results in loss of water content in body to a greater amount. The ions that need to form a proper regulation are also loosed owing to the decrease in body fluids. The surgical practice and operations also lead to the formation of the calcium oxalate stone. The amount of oxalate is generally regulated and used for the body functioning and regulation of body building mechanism hence increase in excess amount of oxalate is seen due to impairment due to the surgery of intestinal season. Hence high oxalate ions and low to high calcium level leads to formation of renal stone.

Obesity

Obesity is a risk factor for stones. Obesity may change the acid levels in the urine, leading to stones.

Medical conditions

Medical conditions that may lead to renal stone formation is

1. Cystinuria
2. Hyperthyroidism
3. UTI
4. Renal tubular acidosis in which there is acid build-up in the body, can raise the risk of calcium phosphate kidney stones.

Medication

Medicines such as protease inhibitors are majorly known to have drug that leads to form renal stones, medication that provides that calcium content to the arthritis patients may also have risk of stone formation. As the medication is well required for the body, no any sort of

avoidance or consumption should be stopped unless and until you take consultant by physician.

Genetical

There are some cases found to have development of stone due to family history of father or mother.

Diagnosis of kidney stone

Kidney stone is often a disease that leads to the diagnosis when is stone is developed enough. Whenever any sort of movement in stone is seen that leads to severe abdominal pain leading to the diagnosis and medical treatment on urgent basis. The pain is so severe that the patient is unable to have moment such to increase in activation of pain receptor. X-ray, CT scan and ultrasound may be an effectives tools for the diagnosis of stone. The process for diagnosis may change depending upon the type of stone. The pain in abdominal or side part may be diagnosed by the means of CT scan or ultrasound. Heamotourea is a condition where blood is found in urine. This condition is also seen when stone leads to causing some tissue injury in the kidney or urinary system. The best effective methods for the diagnosis of the kidney stone are found to be ultrasound which clearly defines the size and location of the stone in kidney or urinary track. Urinalysis can be used for checking the infection status of the kidney as the bigger size capsules leads to the cytotoxicity.

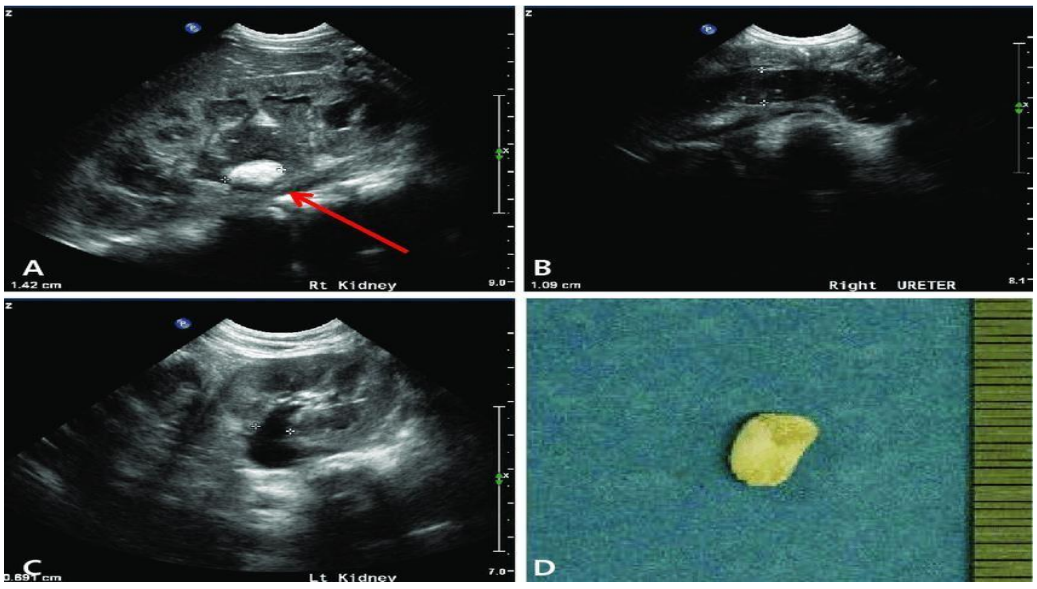

Fig. 5: (A) Renal stones at right renal pelvis (B) stone in right distal ureter region. (C) Multiple stones at left renal medullary portion. (D) 1 cm sized cystine renal stone was extracted spontaneously (Park, 2013).

Blood and Urine tests[12]

Blood examination is mostly done for checking the infection caused by the kidney to the stone. Parameters studies for blood and urine test are colour of urine, clarity of urine, pH, specific gravity, presence of proteins, glucose, ketone, bilirubin, blood, urobilinogen, nitrate, leucocyte esterase and SQ EPI. Blood test may be used to find out the amount of medication causing the kidney stone. UTI is detected for the presence of any sort of microorganism present in the kidney leading to the harmful infections causing kidney damage. Urine and blood analysis is a long-term analysis process that leads to the examination during every state of the stone formation after years of surgery. Thus, the analysis can be performed for the period of one full day at frequent analysis of the urine to examine the amount of stone formed. Depending upon this diagnosis the medication type and frequency can be examined.

Repeated test

Whenever you have any sort diagnosis related to renal stone you need to perform x rays during every time in gap interval of about more than a week. Thus, the x ray examination needs to be analysed for each and every time for the position and size of the stone. Also, a repeated examination can be done for the examination of size and shape. Condition such as haematuria also needs to pe analysed on periodic basis.

Analysis of stone

Stone analysis needs to be examined after the surgical procedure of Shock Wave Lithotripsy, Ureteroscopy and Percutaneous Nephrolithotomy. Thus, after the surgical removal of the stone the stone is send for the analysis. The stone is checked for the composition of calcium, uric acid etc. also after the analysis of the stone it help in future it will be helpful for the treatment related to reoccurrence of stones.

Treatment for kidney stone

The treatment for the kidney stone may involves some natural ways and in some extreme condition the only treatment is surgery. Whenever the stone is found at a position where there is no future way to pass the stone.

Through the urine then the surgery is only option left.The factors that are considered during treatment are

- Location of the stone
- Duration of pain

- Position of pain
- Type of stone diagnose by ultrasound
- Size of the stone present In uterus or bladder state.

Depending upon this following treatment can be performed

Self-passing of stone by urine

The passing of the stone via urine is generally based on the size of the kidney stone. Smaller size stone are easily passable and does not need any sort of medication. The passing of stone is normal such that the release of the stone is not even realized. Excess amount of the water is what needed on daily basis approximately more than 5 liters per day. During this process if there is unbearable pain then you need to take medication associated with pain.

Medication

Some medication such as tamsulosin and some other diuretics have soon to be effective for the passing of the stone. Over-the-counter pain relievers such as acetaminophen or ibuprofen can help. You might also need a drug to ease nausea. Calcium channel blockers and alpha-blockers: These relax your ureter, the tube through which pee passes from your kidney to your bladder. A wider ureter will help the stone move more quickly Potassium citrate or sodium citrate Can help keep kidney stones created by uric acid or calcium oxalate from forming. Certain medications have been shown to help stones pass. The most common medicine prescribed is tamsulosin. Tamsulosin relaxes the ureter, making it easier for the stone to pass. You may also need pain and anti-nausea medicine as you wait.

Surgery treatment

Surgery is a treatment that is only used in case when there is severe pain or failure of the stone to pass or any sort of stone blockade is observed. The surgery can also be used when the passage of stone leads to some activation of the pain receptors. The patient needs to be have a surgery depending upon the location and treatment status.

Following surgical procedures can be performed for the removal of kidney stone.

Shock Wave Lithotripsy (SWL)

Shock wave lithotripsy is an attractive option for patients as it provides a truly minimally invasive approach to achieve overall stone free rates (SFR) approaching 75%. As with any

procedure, case selection and technique are critical to optimize outcomes, minimize morbidity and maximize SFR. Before embarking on SWL treatment, it is vital to discuss the treatment options available (including endourologic options) with patients in order to help patients select their optimal management options. The location for which this technique is used is ureter and kidneys.

The procedure involves following steps:

- Anaesthesia is induced in the patient to provide a relief from pain.
- X ray is done for pinpointing of the stone
- Continuous sound waves lead to the breakdown of the stone into smaller pieces
- These small pieces then pass through urine for some days.

Shock wave lithotripsy generally leads to passage of small pieces freely without any pain. There may be some cases that may lead to pain during passage. SWL is not effective for all types of stone do a proper diagnosis and guidance from the physician is needed.

Ureteroscopy (URS)[16]

Ureteroscopy is a test or procedure that uses a ureteroscope. A ureteroscope is an instrument that examines the inside of the urinary tract. A ureteroscope is longer and thinner than a cystoscope and is used to view the bladder through the ureter, the tube that carries urine from the kidneys to the bladder. Some ureteroscopes are as flexible as thin, long straws (flexible ureteroscopes). Others are harder and more rigid (rigid ureteroscopes). Ureteroscopy is a routine procedure performed by urologists. The most common indication for ureteroscopy is the treatment of upper urinary stones, particularly upper urinary stones that are unsuitable for extracorporeal shock wave lithotripsy or do not respond to this form of treatment. Other, common indications include evaluation of an abnormal lesion revealed by less invasive imaging tools (e.g., intravenous urography (IVU), MRI, CT scanning) or localisation of the source of positive urine culture or cytology results. Thus, ureteroscopy is often an essential part of the diagnostic algorithm and can also be used to treat the underlying disorder.

Procedure

1. A telescope is inserted into the bladder through urethra.
2. flexible guidewire is inserted into the affected ureter up to the kidney.
3. Longer telescope (either rigid or flexible) is then inserted into the ureter and passed upto the kidney.

4. The stone is disintegrated using a mechanical probe or laser and the fragments extracted with special retrieval devices.
5. A stent and catheter can be left in bladder.

Percutaneous Nephrolithotomy (PCNL)

Percutaneous nephrolithotomy is generally a treatment that is used for large stones.Generally, stone having a position difficult to reach.

Procedure for PCNL:

- Patient is given general anaesthesia before PCNL.
- Catheter is placed in the bladder.
- The bladder catheter drains urine from the bladder and remains in place with the use of a balloon.
- One more catheter is placed in ueter. Visualization dye may be introduced through this second catheter.
- This dye helps in finding out appropriate position of the stone.
- Once the stone is found, a fine needle is used to access the extensortopical system and a so-called guidewire is inserted.
- The route is carefully opened until access with the nephroscope is possible.
- If the stones are removed by grasper then it is called as nephrolithotomy.
- Once the stone are removed then the physician will provide introduction of another visualization agent that help is assuring the successful removal of allstones.
- Some patients may use a temporary small tube called a "J double stent" to keep the swelling from blocking the flow of urine. The JJ stent isheld in position with a J-curl in both the kidney and bladder.

Ultrasound and x-ray may be formed for future examination. Stone removed is send forfuture examination for determining composition.

Other Surgery that can be used for removal

Advanced surgical procedure is still under investigation for use of robot for performing surgical operations.

Herbal drugs according to ayurveda which are used intreatment of urolithiasis

Some of the major plants beneficial for antiurolethic activity.

Table no. 1: List of Plant name, their Part and Their mechanism of action[5] for antiurolethiceffect.[4]

Plant name	Plant part	Mechanism of action
Amni visnaga	Whole plant	Potential diuretic effect, khellin & visnagin prevent renal epithelial cell damage caused by oxalate & COM
Aerva lanata	Whole plant	Decrease the crystal ppt phenemenon
hyranthusAspera	Roots	Prevent renal epithelial damage, Diuretic effect
Bergenia ligulata	Rhizomes	COM, Decreases calcium
Cranberry juice	Fruit	Decrease urinary oxalates
Cynodon dactylon	Root	Increase COD as compare to COM
Costus spiralis	Tubers	Decrease stone size
Dolichos biflorus	Seeds	oxalate crystals
Grapefruit juice	Fruit	Increases urinary excretion mechanism
Herniaria hirsute	Whole plant	Decrease crystal size & increase COD, diuretic
Lemonade juice	Fruit	Increases urinary excretion
Moringa oliefera	Pods, Bark,Root wood.	crystal excretion in urine and retention in renal tissues
aronychiaargentea	Aerial parts	Antioxidant activity
ıyspermumammi	Seeds	Maintain renal functioning; Reduce renal injury and decrease crystal excretion in urine and retention in renal tissues

Herbal marketed product used for treatment of kidney stone

1. Cystone tablets
2. Urogin Pathri Nashak
3. Uritone Capsules
4. Uritone Syrup
5. Calsecure Syrup
6. STOBye Capsules
7. Biostone Combo
8. Lithocrush Capsules
9. Kidney Detox
10. Calcury Tablet
11. Dravyam
12. Sanyasi Pathri Tablet
13. Pasanbhed Powder by ultra healthcare
14. Guapha Ayurveda Kidney Wellness

CONCLUSION

The present review contains the brief introduction about the kidney stone and urolithic

studies. Herbal remedies are gaining a lot interest as it leads to less toxicity and effective for long terms. The perfect medication for the kidney stone in modern medicine is still not developed. The rise in interest for natural and ayurvedic plants have been used for kidney stone. Many plants containing active ingredients have shown to reduce the frequency and removal of kidney stone. Many formulation acts by different mechanism hence making it difficult to understand the proper pathophysiology of the antiurolethic activity by these plant constituents. Additionally, herbal medication is now been marketed in all sort of dosage form of tablet capsules, syrups etc. Still proper research is needed to understand the core concepts and proper mechanism of action of all the plants that leads to decrease in kidney stone.

Acknowledgement

The authors declare no acknowledgement regarding the publication of this paper.

REFERENCES

1. Wang Z, Zhang Y, Zhang J, Deng Q and Liang H: Recent advances on the mechanisms of kidney stone formation (Review). Int J Mol Med, 2021; 48: 149.
2. Malvinder S Parmar, BMJ Clinical Research, 2004; 328: 1420-4. https://www.researchgate.net/publication/8515402.
3. Luke F. Reynolds, Tad Kroczak, Kenneth T. Pace, Indications and contraindications for shock wave lithotripsy and how to improve outcomes, Asian Journal of Urology, 2018; 5: 256-263.
4. H. Wilkinson, "Clinical investigation and management of patients with renal stones," *Annals of Clinical Biochemistry*, 2001; 38, 3: 180–187.
5. Ajay Kumar Shukla, Surat Shukla, Ashish Garg, Sweta Garg, A Review On Anti-Urolithiatic Activity Of Herbal Folk Plants, Asian Journal of Biomaterial Research, 2017; 3(2): 1-11.
6. Vamsi sodimbaku*, latha pujari, urolithiasis–an updated review over genetics, pathophysiology and its clinical management,int j pharm pharm sci, 6, 11: 23-31.
7. T. Vijaya, M. Sathish Kumar, N. V. Ramarao, A. Naredra Babu, N. Ramarao. Urolithiasis and Its Causes- Short Review The Journal of Phytopharmacology, 2013; 2(3): 1-6.
8. Suresh v chennupati, narayana rao alla*, m s c bose, anusha g, sravani a, study on anti urolithiasis activity of some common medicinal plants alcoholic extracts, An International Journal of Advances in Pharmaceutical Sciences, 2015; 6: 2784-2789.
9. Anubhav Nagal, Rajeev K Singla, Herbal Resources with Antiurolithiatic Effects: A

Review, Indo Global Journal of Pharmaceutical Sciences, 2013; 3(1): 6-14.

10. T. Nageswari a and K. Swathi, A Review on Antiurolithiatic (Pashanabeda) Effects of Herbal and Marine Resources, Pak. J. Pharm. Sci., 2016; 29, 6: 2129-2139.
11. Khan SR, Pearle MS, Robertson WG, Gambaro G, Canales BK, Doizi S, Traxer O, Tiselius HG. Kidney stones. Nat Rev Dis Primers, 2016; 25, 2: 16008. Doi: 10.1038/nrdp.2016.8. PMID: 27188687; PMCID: PMC5685519
12. Rahul Deo Yadav*, S. K. Jain, Shashi Alok, Alok Mahor, Jay Prakash Bharti and Manoj Jaiswal, herbal plants used in the treatment of urolithiasis: a review, ijpsr, 2011; 2(6): 1412-1420.
13. Tilahun Alelign and Beyene Petros, Kidney Stone Disease: An Update on Current Concepts, Hindawi Advances in Urology, 2018, Article ID 3068365, 12 pages https://doi.org/10.1155/2018/3068365.
14. Khan F, Haider MF, Singh MK, et al. A comprehensive review on kidney stones, its diagnosis and treatment with allopathic and ayurvedic medicines. Urol Nephrol Open Access J., 2019; 7(4): 69–74. DOI: 10.15406/unoaj.2019.07.00247.
15. "A REVIEW ARTICLE ON HERBAL DRUG FOR KIDNEY STONE", International Journal of Emerging Technologies and Innovative Research (www.jetir.org | UGC and issn Approved), ISSN:2349-5162, 2022; 9, 10: Ppb451-b464. Available at: http://www.jetir.org/papers/JETIR2210165.pdf.
16. Aslam Khan1,2, Saeed R. Khan3, and Anwar H. Gilani, Studies on the in vitro and invivo antiurolithic activity of Holarrhena antidysenterica, Urol Res, 2012; 40(6): 671–681. doi:10.1007/s00240-012-0483-1.
17.