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HERBAL AND ALLOPATHIC MEDICINE FOR KIDNEY, GALLBLADDER AND URINARY STONES: A REVIEW

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ABSTRACT: Medicinal plants have been known for millennia and are highly esteemed all over the world as a rich source of therapeutic agents for the prevention of various ailments. Today large number of population suffers from kidney stone, gall stone and urinary calculi. Stone disease has gained increasing significance due to changes in living conditions *i.e.* industrialization and malnutrition. Changes in prevalence and incidence, the occurrence of stone types and stone location, and the manner of stone removal are explained. Medicinal plants are used from centuries due to its safety, efficacy, cultural acceptability and lesser side effects as compared to synthetic drugs. The present article deals with measures to be adopted for the potential of medicinal plants in stone dissolving activity. The problem of urinary stones or calculi is a very ancient one and many remedies have been employed during the ages these stones are found in all parts of the urinary tract, the kidney, the ureters and the urinary bladder and may vary considerably in size. In the present article, an attempt has been made to emphasis on herbal option for urinary stone.

INTRODUCTION: All over the world especially in developing countries, approximately 80% of population continues to use traditional medicine in primary medical problems. In the past decade, therefore, research has been focused on scientific evaluation of traditional drugs of plant origin. There is an urgent need to systematically evaluate the plants used in traditional medicine. Such research could lead to new drug discovery or advance use of indigenous herbal medicines for treatment. This revival of interest in plant derived drugs is mainly due to the current widespread belief that green medicine is safe and more dependable than the costly synthetic drugs many of which have adverse side effects.[1]

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Nature bestowed our country with an enormous wealth of medicinal plants. Plants have been used as traditional healthcare system from the centuries. The WHO has listed 20,000 medicinal plants globally in which contribution of India is 15-20%. [2] The WHO reported that 80% of global countries depend on the medicinal plants. [3] A large body of evidence has collected to show potential of medicinal plants used in various traditional systems. In the last few years more than 13 000 plants have been studied for the various diseases and ailments all over the world. [4] Kidney stones are also major disorders prevailing all over the world. About 75% of kidney stones are composed of calcium oxalate crystals. [5]

Urolithiasis is the process of forming a stone in the kidney or in the urinary tract. The development of the stones is related to decreased urine volume or increased excretion of stone-forming components such as calcium, oxalate, urate, cystine, xanthine, and phosphate. [6-8]

The blood in the urine and pain in the abdomen, flank, or groin were seen during the Urolithiasis. Kidney stones occur in 1 in 20 people at some time in their life. Urinary composition determines stone formation based on three factors: exceeding the formation product of stone forming components, the quantity of inhibitors (*e.g.*, citrate, glycosaminoglycans, etc.) and promoters (*e.g*., sodium, urates, etc.) in the urine. The stones form in the urine collecting area (the pelvis) of the kidney and may range in size from tiny to the size of the renal pelvis itself. Currently no allopathic medicines are available for urolithiasis.[9]

The problem of urinary stones or calculi is a very ancient one and many remedies have been employed during the ages these stones are found in all parts of the urinary tract, the kidney, the ureters and the urinary bladder and may vary considerably in size, Linacre, who had founded the college of physicians, died of urinary stone in 1518 in London, a condition he could diagnose but could not be true. [10] Herbs and herbal drugs have efficient pharmacological action and potent effects on body. Also, the overuse of synthetic drugs, which results in higher incidence of adverse drug reactions, has motivated humans to return to nature for safe remedies. The concept of 'Traditional' medicines for the developing countries. The problem of urinary stones or calculi is a very ancient one. The incidence of urolithiasis is very common in Northern India compared to southern state. [11] Surgery, lithotripsy, and local calculus disruption using a high power laser are used to treat calculi. [12-14]

2. Pathophysiology:

Gall stone: Mainly affects people in global countries. More than half a million people are affected annually in United States and more than 50 000 people in Canada. Canada endures surgical treatment to remove their gall bladder because of gall stone. About 80 % of all the gall stones has evidence for no symptoms and may continue for years. [15] Also, the over use of synthetic drugs, which results in higher incidence of adverse drug reactions, has motivated humans to return to nature for safe remedies. The origins, according to many, can be sourced to the World Health Organization's Canberre conference in 1976, which promoted the concept of 'Traditional' medicines for the developing countries. [16] Gall stones are collections of cholesterol, bile pigment, which can form in the gallbladder or surrounded by the bile ducts of the liver. In the United States, the most universal category of gallstones is made of cholesterol. Cholesterol stones are mainly causes due to difference in the production of cholesterol or the secretion of bile. Pigmented stones are mainly composed of bilirubin, which is an element formed due to the normal breakdown of red blood cells. Bilirubin gallstones are more common in Asia and Africa but they are seen in diseases that break red blood cells such a sickle cell anaemia. [17]

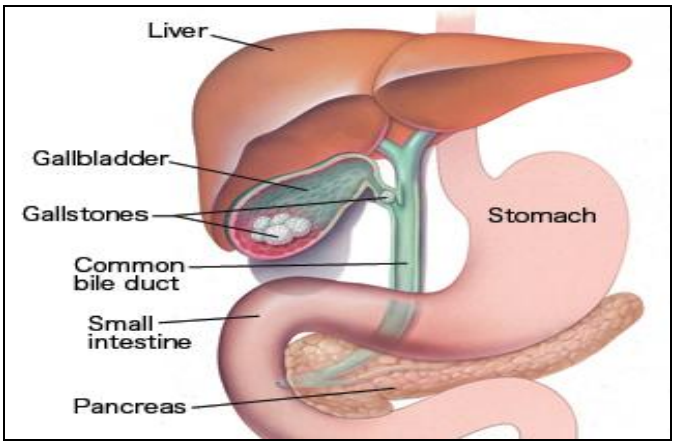

FIG. 1: GALL BLADDER STONE

Kidney stones are hard, solid particles that form in the urinary tract. In many cases, the stones are very small and can pass out of the body without any problems. However, if a stone (even a small one) blocks the flow of urine, excruciating pain may result, and prompt medical treatment may be needed. Recurrent stone formation is a common part of the medical care of patients with stone disease. Calcium- containing stones, especially calcium oxalate monohydrate, calcium oxalate dihydrate and basic calcium phosphate are the most commonly occurring ones to an extent of 75-90% followed by magnesium ammonium phosphate (Struvite) to an extent of 10- 15%, uric acid 3-10% and cystine 0.5-1%. [18]

In most of the cases the commonly occurring stones are calcium oxalate or magnesium ammonium phosphate type. Helps in spontaneous passage of calculi by increasing urine volume, pH and anti-calcifying activity. Balance the Inhibitor and promoter of the crystallization in urine and affects the crystal nucleation, aggregation and growth

(Crystallization inhibition activity). Relieves the binding mucin of calculi (lithotripticactivity) Improved renal function.[19]

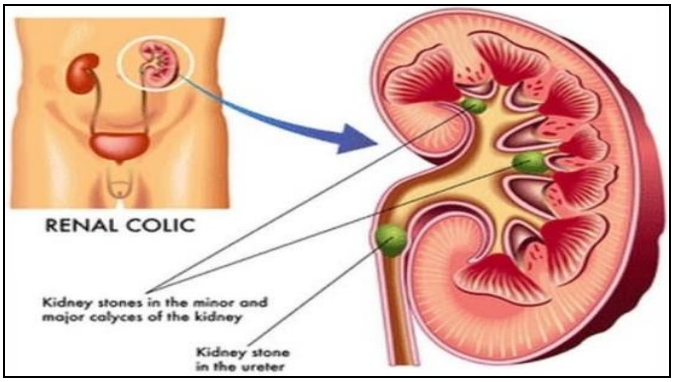

FIG. 2: KIDNEY STONE

Urinary stone: Constitute one of the commonest diseases in our country and pain due to kidney stone is known as worse than that of labour pain. Among all the pain, abdominal pain always drags not only patient's attention but also the curiosity of the surgeon. It is estimated that 12% of world population experience renal stone disease with a recurrence rate of 70-80% in men and 47-60% in women. [20-22] Urinary calculi is composed of hard mineral masses lodged anywhere in the urinary tract. The urinary tract consists of organs which filter blood to eradicate liquid waste (urine) that is excreted from the body *i.e.* kidneys, ureter, bladder and urethra.

The stones firstly form in the kidney and then it travel to other parts of the urinary tract where they may become trapped in smaller tubes *e.g.* bladder stones, ureteric stones and kidney stones. The condition may be extremely painful. [23] Urolithiasis is complex encompassing several physicochemical events occurring sequentially or concurrently. Where by calcium oxalate crystals are retained in the kidney and form renal stones remain incompletely understood. UTI is an important predisposing factor in infants and younger children. The organisms commonly isolated are urease splitting species of *Proteus, Klebsellia, Pseudomonas, Staphylococcus* and some anaerobes. These microbes split urea leading to an increase in the urinary pH, which in turn raises the urinary concentration of magnesium ammonium phosphate ions creating a favourable environment for stone formation.[24-25]

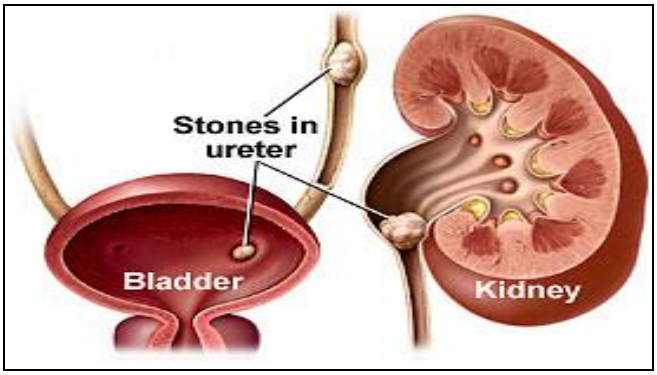

FIG. 3: URINARY STONE

Lithiasis: is characterized by the formation of a stone in the kidneys or urinary tracts. [26] The crystals of calcium oxalate (CaOx) are the primary constituent of more than 60% of the majority of human kidney stones; they exist in the form of CaOx monohydrate (COM) and CaOx dihydrate (COD). [27] The pathogenesis of calcium oxalate stone formation is a multi-step process and in essence includes nucleation, crystal growth, crystal aggregation and crystal retention. The stone formation requires supersaturated urine. Supersaturation also depends on urinary pH, ionic strength, solute concentration and complexations .[28]

3. Types of Urolithiasis: The stone type is named after its mineral composition. The most common stones are struvite (magnesium ammonium phosphate), calcium oxalate, urate, cystine and silica. [29]

TABLE 1: DIFFERENT TYPES OF UROLITHIASIS

Name of stone	Approximate incidence	Constituents
Calcium oxalate	70% of all stones	Calcium, oxalate
Calcium phosphate	10% of all stones	Calcium, phosphate
Uric acid	5-10% of all stones	Uric acid
Struvite	10% of all stones	Calcium, ammonia, phosphate
Cystine	Less than 1% of all stones	Cystine
Medication-induced stone	Less than 1% of all stones	Composition depends on medication or herbal products

3.1 Calcium oxalate stones: The most common type of kidney stones worldwide contains calcium. For example, calcium-containing stones represent about 80% of all cases in the United States; these typically contain calcium oxalate either alone or in combination with calcium phosphate in the form of

apatite orbrushite. [30, 31] Factors that promote the precipitation of oxalate crystals in the urine, such as primary hyperoxaluria, are associated with the development of calcium oxalate stones. [32] The formation of calcium phosphate stones is associated with conditions such as hyperparathyroidism [33] and renal tubular acidosis. [34] Oxaluria is increased in patients with certain gastrointestinal disorders including inflammatory bowel disease such as Crohn disease or patients who have undergone resection of the small bowel or small bowel bypass procedures. Oxaluria is also increased in patients who consume increased amounts of oxalate (found in vegetables and nuts). Primary hyperoxaluria is a rare autosomal recessive condition which usually presents in childhood. Calcium oxalate stones appear as 'envelopes' microscopically. They may also form 'dumbbells'. [35]

Calcium oxalate crystals in the urine are the most common constituent of human kidney stones, and calcium oxalate crystal formation is also one of the toxic effects of ethylene glycol poisoning. Hydrated forms of the compound occur naturally as three mineral species: whewellite (monohydrate, known from some coal beds), weddellite (dihydrate) and a very rare trihydrate called caoxite. Most crystals look like a 6 side prism and often look like a pointed picket from a wooden fence. More than 90% of the crystals in urine sediment will have this type of morphology. These other shapes are less common than the 6 sided prisms, however it is important to be able to quickly identify them in case of emergency. [36]

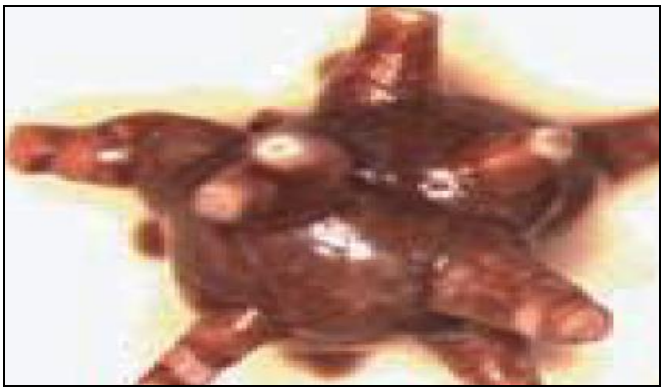

FIG. 4: CALCIUM OXALATE STONE (MONOHYDRATE)

3.2 Struvite stones: About 10–15% of urinary calculi are composed of struvite (ammonium magnesium phosphate, $NH_4MgPO_4.6H_2O$).[37] Struvite stones (also known as "infection stones", urease or triple-phosphate stones), form most often in the presence of infection by urea-splitting bacteria. Using the enzyme urease, these organisms metabolize urea into ammonia and carbon dioxide. This alkalinizes the urine, resulting in favorable conditions for the formation of struvite stones. *Proteus mirabilis, Proteus vulgaris,* and *Morganella morganii* are the most common organisms isolated; less common organisms include Ureaplasma urealyticum, and some species of *Providencia, Klebsiella, Serratia,* and *Enterobacter.* These infection stones are commonly observed in people who have factors that predispose them to urinary tract infections, such as those with spinal cord injury and other forms of neurogenic bladder, ileal conduit urinary diversion, vesicoureteral reflux, and obstructive uropathies.

They are also commonly seen in people with underlying metabolic disorders, such as idiopathic hypercalciuria, hyperparathyroidism, and gout. Infection stones can grow rapidly, forming large calyceal staghorn (antler-shaped) calculi requiring invasive surgery such as percutaneous nephrolithotomy for definitive treatment. [38] Struvite stones (triple phosphate/magnesium ammonium phosphate) have a'coffin lid' morphology by microscopy. [39] Magnesium, ammonium and phosphorus are the building blocks for the formation of struvite crystals in urine. In addition, urine pH and its influence on the concentration of trivalent ionic phosphate (PO_4^{3-}) play a key role in struvite crystallization. As urine pH increases, H_3PO_4, $H_2PO_4^{1-}$ and HPO_4^{2-} are rapidly deprotonated (*i.e.*, removal of hydrogen ions) increasing the concentration of PO_4^{3-}, a principal component and driving force for struvite crystal formation.

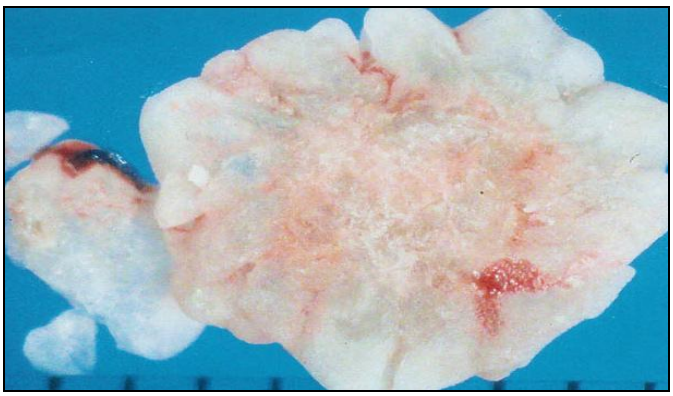

FIG. 5: STRUVITE STONE

3.3 Uric acid stones: About 5–10% of all stones are formed from uric acid. [40] People with certain metabolic abnormalities; including obesity [41] may produce uric acid stones. They also may form in association with conditions that cause hyperuricosuria (an excessive amount of uric acid in the urine) with or without hyperuricemia (an excessive amount of uric acid in the serum). They may also form in association with disorders of acid/base metabolism where the urine is excessively acidic (low pH), resulting in precipitation of uric acid crystals. A diagnosis of uric acid urolithiasis is supported by the presence of a radiolucent stone in the face of persistent urine acidity, in conjunction with the finding of uric acid crystals in fresh urine samples. [42]

As mentioned above (section on calcium oxalate stones), patients with inflammatory bowel disease (Crohn disease, ulcerative colitis) tend to have hyperoxaluria and form oxalate stones. These patients also have a tendency to form urate stones. Urate stones are especially common after colon resection. Uric acid stones appear as pleomorphic crystals, usually diamond-shaped. They may also look like squares or rods which are polarizable. [43] Patients with hyperuricosuria can be treated with allopurinol which will reduce urate formation. Urine alkalinization may also be helpful in this setting. Patients with hyperuricosuria can be treated with allopurinol which will reduce urate formation. Urine alkalinisation may also be helpful in this setting.

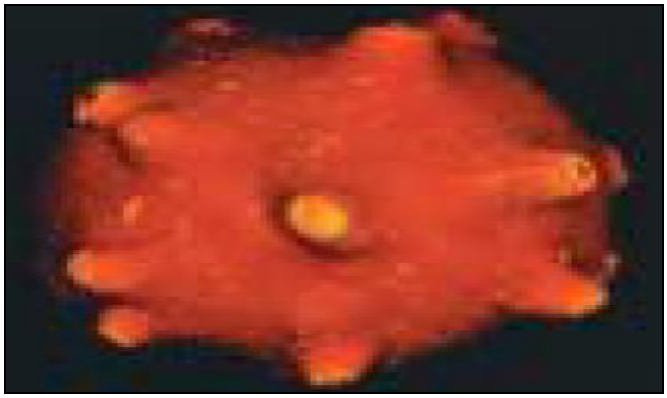

FIG. 6: URIC ACID STONES

3.4 Cystine stones: Cystine kidney stones are due to cystinuria, an inherited (genetic) disorder of the transport of an amino acid (a building block of protein) called cystine that results in an excess of cystine in the urine (cystinuria) and the formation of cystine stones. Cystinuria is the most common defect in the transport of an amino acid. Although cystine is not the only overly excreted amino acid in cystinuria, it is the least soluble of all naturally occurring amino acids. Cystine tends to precipitate out of urine and form stones (calculi) in the urinary tract. Small stones are passed in the urine. However, big stones remain in the kidney (nephrolithiasis) impairing the outflow of urine while medium-size stones make their way from the kidney into the ureter and lodge there further blocking the flow of urine (urinary obstruction).

Obstruction of the urinary tract puts pressure back up on the ureter and kidney. Causing the ureter to widen (dilate) and the kidney to be compressed. Obstruction also causes the urine to be stagnant (not moving), an open invitation to repeated urinary tract infection. The pressure on the kidneys and the urinary infections results in damage to the kidneys. The damage can progress to renal insufficiency and end-stage kidney disease, requiring renal dialysis or a transplant. [44]

The stone are responsible for all the signs and symptoms of cystinuria, including:

- Hematuria -- blood in the urine
- Flank pain -- pain in the side, due to kidney pain
- Renal colic -- intense, cramping pain due to stones in the urinary tract
- Obstructive uropathy -- urinary tract disease due to obstruction
- Urinary tract infections

FIG. 7: CYSTINE STONES

3.5 Silicate stones or drug induced stones: Very rarely, stones can form as a result of taking certain medications or herbal products and the subsequent build-up of chemicals from those products in the

urine. Some of these are Loop diuretics, Acetazolamide, Topiramate, Zonisamide, Laxatives (when abused), Ciprofloxacin, Sulfa medications, Triamterene, Indinavir, Ephedrine, Guaifenesin, and products containing silica. [45]

4. Causes of Urolithiasis: Dietary factors that increase the risk of stone formation include low fluid intake and high dietary intake of animal protein, sodium, refined sugars, fructose and high fructose corn syrup [46], oxalate [41], grapefruit juice, apple juice, and cola drinks. Stone formation commonly occur due to inadequate urinary drainage, foreign bodies in urinary tract, microbial infections, diet with excess oxalates and calcium, vitamin abnormalities like vitamin A deficiencies, excess vitamin D, and metabolic diseases like hyperthyroidism, cystinuria, gout, intestinal dysfunction etc. [47] Calcium oxalate is considered as main constituent in the renal calculi.

4.1 Calcium: Calcium is one component of the most common type of human kidney stones, calcium oxalate. Unlike supplemental calcium, high intakes of dietary calcium do not appear to cause kidney stones and may actually protect against their development. [41, 48] This is perhaps related to the role of calcium in binding ingested oxalate in the gastrointestinal tract. As the amount of calcium intake decreases, the amount of oxalate available for absorption into the bloodstream increases; this oxalate is then excreted in greater amounts into the urine by the kidneys. In the urine, oxalate is a very strong promoter of calcium oxalate precipitation, about 15 times stronger than calcium.

Aside from calcium, other electrolytes appear to influence the formation of kidney stones. For example, by increasing urinary calcium excretion, high dietary sodium may increase the risk of stone formation.[41] Fluoridation of drinking water may increase the risk of kidney stone formation by a similar mechanism, though further epidemiologic studies are warranted to determine whether fluoride in drinking water is associated with an increased incidence of kidney stones. [49] On the other hand, high dietary intake of potassium appears to reduce the risk of stone formation because potassium promotes the urinary excretion of citrate, an inhibitor of urinary crystal formation. High dietary intake of magnesium also appears to reduce the risk of stone formation somewhat, because like citrate, magnesium is also an inhibitor of urinary crystal formation. [41]

4.2 Vitamins: Despite a widely held belief in the medical community that ingestion of Vitamin C supplements is associated with an increased incidence of kidney stones [50]; the evidence for a causal relationship between Vitamin C supplements and kidney stones is inconclusive. While excess dietary intake of Vitamin C might increase the risk of calcium oxalate stone formation, in practice this is rarely encountered. The link between Vitamin D intake and kidney stones is also tenuous. Excessive Vitamin D supplementation may increase the risk of stone formation by increasing the intestinal absorption of calcium, but there is no evidence that correction of Vitamin D deficiency increases the risk of stone formation. [41]

4.3 Other: There are no conclusive data demonstrating a cause-and-effect relationship between alcohol consumption and kidney stones. However, some have theorized that certain behaviours associated with frequent and binge drinking can lead to systemic dehydration, which can in turn lead to the development of kidney stones.[51] The American Urological Association has projected that increasing global temperatures will lead to an increased incidence of kidney stones in the United States by expanding the "kidney stone belt" of the southern United States. [52]

4.4 Supersaturation of urine: When the urine becomes supersaturated (when the urine solvent contains more solutes than it can hold in solution) with one or more calculogenic (crystal-forming) substances, a seed crystal may form through the process of nucleation. Heterogeneous nucleation (where there is a solid surface present on which a crystal can grow) proceeds more rapidly than homogeneous nucleation (where a crystal must grow in liquid medium with no such surface), because it requires less energy. Adhering to cells on the surface of a renal papilla, a seed crystal can grow and aggregate into an organized mass. Depending on the chemical composition of the crystal, the stone-forming process may precede more rapidly when the urine pH is unusually high or low. [53]

Supersaturation of the urine with respect to a calculogenic compound is pH-dependent. For example, at a pH of 7.0, the solubility of uric acid in urine is 158 mg/100 ml. reducing the pH to 5.0 decreases the solubility of uric acid to less than 8 mg/100 ml. The formation of uric acid stones requires a combination of hyperuricosuria (high urine uric acid levels) and low urine pH; hyperuricosuria alone is not associated with uric acid stone formation if the urine pH is alkaline. Supersaturation of the urine is a necessary, but not a sufficient, condition for the development of any urinary calculus. Supersaturation is likely the underlying cause of uric acid and cystine stones, but calcium-based stones (especially calcium oxalate stones) may have a more complex etiology.[54]

4.5 Inhibitors of stone formation: Normal urine contains chelating agents such as citrate that inhibit the nucleation, growth and aggregation of calcium-containing crystals. Other endogenous inhibitors include calgranulin (an S-100 calcium binding protein), Tamm-Horsfall protein, glycosaminoglycans, uropontin (a form of osteopontin), nephrocalcin (an acidic glycoprotein), prothrombin F1 peptide, and bikunin (uronic acid-rich protein). The biochemical mechanisms of action of these substances have not yet been thoroughly elucidated. However, when these substances fall below their normal proportions, stones can form from an aggregation of crystals. Kidney stones often result from a combination of factors, rather than a single, well-defined cause. Stones are more common in people whose diet is very high in animal protein or who do not consume enough water or calcium. They can result from an underlying metabolic condition, such as distal renal tubular acidosis, Dent's disease, hyperpara thyroidism, primary hyperoxaluruia or medullary sponge kidney.

In fact, studies show about 3% to 20% of people who form kidney stones have medullary sponge kidney. Kidney stones are also more common in people with Crohn's disease. People with recurrent kidney stones are often screened for these disorders. This is typically done with a 24-hour urine collection that is chemically analyzed for deficiencies and excesses that promote stone formation.[55]

5. Current Treatment/Prevention Options:

5.1 Treatment: The accepted management of stone disease ranges from observation (watchful waiting) to surgical removal of the stone. Various factors such as size of calculi, severity of symptoms, degree of obstruction, kidney function, location of the stone and the presence or absence of associated infection influence the choice of one type of intervention over the other. [56] Stones which are smaller than 5mm have a high probability of spontaneous passage which can take up to 40 days. [57] During this watchful waiting period, patients can be treated with hydration and pain medication. [58] However, stones larger than 5mm or stones that fail to pass are treated by interventional procedures. [58] Open surgical procedures for the treatment of ureteric stones have gradually disappeared in the last 30 years and have been replaced by minimal invasive techniques such as ESWL or ureteroscopy. ESWL is a non-invasive procedure which uses shock waves to fragment calculi. [59]

This technique is the most widely used method for managing renal and ureteral stones. However, treatment success rates depend on stone composition, size, properties and location of the stone as well as the instrumentation type and shock frequency.[58] It also needs to be considered that the same forces that are directed at the stones have deleterious effects on surrounding tissues.[59] Damage to almost every abdominal organ system has been reported [60, 61] but by far the most common injury is acute renal haemorrhage although its true incidence is unclear and poorly defined. Most often renal haemorrhage can be managed conservatively; however, in rare instances the complications are fatal.[59] Reports of post-ESWL perirenal hematoma range from less than 1% to greater than 30%.[62] Furthermore, ESWL has been associated with long-term medical effects such as diabetes mellitus and hypertension.[63]

In addition to ESWL, other procedures such as ureteroscopy (URS) have been developed for removal of ureteral stones. The new generations of uteroscopes are flexible, smaller in diameter, stiffer and more durable, and have an improved tip deflection.[58]

The major drawback of URS is that it is more invasive than ESWL and the rate of ureteric

perforation and stricture formation remains around 2 to 4%.[64] In contrast, the major advantage of URS is that it is cheaper and results in higher and faster stone free rates.[56, 58] It remains unclear which treatment modality is better than the other and the final decision should be based on the patients preference, on the size and the location of the stone, expertise of the physician and the costs of the procedure.[58]

5.2 Prevention: Despite the major technical achievements for stone removal in the last three decades the problem of recurrent stone formation remains. As mentioned earlier the recurrence rate of kidney stones is approximately 15% in the first year and as high as 50% within five years of the initial stone. [65] Effective kidney stone prevention is dependent on the stone type and the identification of risk factors for stone formation. An individualized treatment plan incorporating dietary changes, supplements, and medications can be developed to help prevent the formation of new stones. Regardless of the underlying etiology of the stone disease, patients should be instructed to increase their fluid intake in order to maintain a urine output of at least 2 L/d. A high fluid intake reduces urinary saturation of stone-forming calcium salts and dilutes promoters of CaOx crystallization. A high sodium intake increases stone risk by reducing renal tubular calcium re-absorption and increasing urinary calcium. Patients should be advised to limit their dietary sodium intake to 2000–3000 mg/d.[66]

A restriction of animal proteins is also encouraged since animal proteins provide an acid load because of the high content of sulfur-containing amino acids. Thus, a high protein intake reduces urine pH and citrate and enhances urinary calcium excretion via bone resorption and reduces renal calcium reabsorption. [67] Stone formers should not be advised to restrict calcium unless it has been shown that they have an excessive intake of calcium. [65] A reduced intake of calcium leads to an increased intestinal absorption of oxalate, which itself may account for an increased risk of stone formation. Vitamin C has been implicated in stone formation because of in vivo conversion of ascorbic acid to oxalate. Therefore, a limitation of Vitamin C supplementation to 500 mg/d or less is recommended. [66]

When dietary modification is ineffective, pharmacological treatment should be initiated. The most effective hypocalciuric agents are thiazide diuretics which hypocalciuric action enhance calcium reabsorption in the distal renal tubules. [68] However, long term use in up to 50% of patients is limited because of side effects including fatigue, dizziness, impotence, musculoskeletal symptoms, or gastrointestinal complaints. [66]

Another complication is thiazide-induced potassium depletion, which causes intracellular acidosis and can lead to hypokalemia and hypocitraturia. [69] Potassium citrate is effective in the treatment of patients who have calcium stones and normal urinary calcium. By providing an alkali load, potassium citrate increases urinary pH and citrate, therefore mediating the inhibitory effects of macromolecular modulators of calcium oxalate crystallization. [70] The main limitation for a more widespread use of alkali citrate preparations is the relatively low tolerability of available alkali citrate preparations. Adverse effects that reduce treatment compliance have been noted mainly in the gastrointestinal tract and include eructation, bloating, and diarrhea. [70] In conclusion, none of the listed treatment modalities is without any side effects. Thus, the focus should be on the development of novel strategies for the prevention and treatment of kidney stone disease. Herbal medicines could close a gap in this regard.

6. Currently Used Herbal Medicines:

6.1 Pashanbheda drugs: An attempt has been made during the last decade to study the identical, chemistry, pharmacology and clinical investigations of Pashanbheda plants used for dissolving kidney stones. [71]

Pashanbheda is a drug mentioned in the Ayurvedic system of medicine for various ailments but mainly as a diuretic and lithotriptic. It is said to have properly of breaking and disintegrating the stones and is widely used drug. However, its identity is yet debatable. Many diuretic and other plants such as *Alternanthera sessalis* and *Aerva spp*. In South India.[72] *Rotula aquatica* in Mysore [73], *Ammaunia baceifera* in Kerala [72], *Bauhinia racemosa*, *Coleus spp., Bryophyllum spp., Didymocarpus pedicellata*, *Ocimum basilicum* in Bengal [74] and many other have been referred to as Pashanbheda from time to

time. Now *Bergenia ligulata syn. Saxifrega ligulata* is being widely accepted under this name. Chemical efficiency of *Bergenia ligulata* is dissolving the urinary stones fully justifies the use of various names attributed to it, *viz.,* Pashanbheda, Pashana, Asmaribheda, Ashmabhid, Ashmabhed, Nagabhid, Upalbhedak, Parwatbhed and Shilabhed (dissolving or piercing stones or slabs) etc. [75]

The very first mention of this drug in Ayurvedic literature is Charak Samhita (210 BC-170 AD) under the name Pashanbhed. It is recommended for painful micturition, for curing abdominal tumour and for breaking up calculi, Sushruta Samhita (170 AD- 340 BC) mentions the drug under various synonyms in Chikitsa silianam- under the name Pashanbhed for uric acid calculi and Ashnibhid for biliary calculi. In Sushruta Samhita, decoction of Pashanbhed, Ashmantaka, Satavari, Vrihati, Bhalluka, Varuna (Crataeva nurvula), kulatha, kola and kataka seeds have been described for the patients of Vataja Ashmari, while Kusa, Ashmabhid, Patala, Trikantaka, Sirisha, Punarnava and Silajatu and Meduka flower for Pittaja Ashmari have been mentioned.[76] Ashtang Hridaya (341 AD-434 AD) mentions the drugs in chiktsit Sthanam-Upalbhed for extreme pain due to obstructed micturition, Pashanbhed for uric acid calculi and ashmabid for biliary calculi.

In Susruta Samhita "Kurantika" or "Sitivaraka" (*Celosia argental*) is tested in 'Viratarvadigana', which is said to have specific action in urinary diseases, *viz*., calculi (ashmari), gravels (sarkara), dysuria (*Mutra krichhra*) and suppression of urine etc. *Aerva spp., Ammania baccifera* and *Nothosasrva brachiata* have been reported from South India as lithotriptic plants.[77] *Celosia argental* in Indian system of medicine is considered to be specific for the treatment of ashmari *i.e.*, urinary stone. Aqueous decoction is used for the dissolution and excretion of stones.[78]

Didymocarpus pedicellata, commonly known as Patharphodi or Shila pushp is useful for stones of kidney and bladder, while *Homonoia riparia*, known as Pashanbhed or kshudra Pashanbhed is useful in vesical calculi. *Rotula aqualica* syn. *Rhabdia lycioides*, also known as Pashanbhed is useful for stones in bladder. *Bergenia ligulata*, syn. *Saxifraga ligulata*, known as Pashanbheda have strong diuretic and lithotriptic activities but *Kalanchoe pinnala* syn. *Bryophyllum calycinum* known as Pashanbhed in Bengal, and others have no diuretic or lithotriptic activity *Bridelia Montana* also known as Pashanbhed has also not shown any such activites. [79] *Tribulus terrestris* fruits have also been found useful in diuretic and kidney stones. [80] Effective cure of urinary calculi have been prescribed by practitioners in unani system of medicine [81], while in Homoeopathic system of medicine, *Berberis vulgaris*, *Cantharis spp.,* and *Lycopodium spp*. are being use. Herbal drugs used in kidney stone, gall stone, urinary calculi are defined below in **Table 2**.

TABLE 2: LISTS OF PLANT DRUGS USED IN KIDNEY STONE, GALL STONE, URINARY CALCULI [82-101]

S.no.	Botanicals name	Common name	Part use	Used
1.	*Alhagi mannifera* (Leguminosae)	Camels thorn	Roots	For kidney pebbles and Sands
2.	*Armoracia lopathifolia* (Brassicaceae)	Horse radish	Seeds	Diuretic, Kidney Stones
3.	*Aerva javanica* (Amaranthaceae)	No	Seed heads	Diuretic, Purgetive, Demulcent
4.	*Aerva lanata* (Amaranthaceae)	Gorkhabundi	Leaves	Cough, Sore throat, Diabetes, Lithiasis
5.	*Ammannia baccifera* (Lythraceae)	Dadamari	Root	Ringworm, Parasitic skin affection, Anti-typhoid
6.	*Arctostaphylos ura ursi* (Asteraceaer)	Bearberry	Fruits	Diuretic, Diaphoretic, Gout, Skin affection
7.	*Ascyrum hypericoides* (Asclepidaceae)	Ascus	Root & Leaves	Emetic and Catharatic
8.	*Asparagus racemosus* (Liliaceae)	Satavar	Root	Herb tonic, Diuretic, Galactagogue
9.	*Abutilon indicum* (L.) Sweet (Malvaceae)	Indian Mallow	Seed & Leaf	Extract is given for urinary disorder
10.	*Abutilon indicum* (L.) (Malvaceae)	Indian Mallow	Leaves	Juice taken twice daily for two weeks
11.	*Aegle marmelose* (L.) (Rutaceae)	Wood apple, Bael	Leaves and fruit	1 spoon of Fruit pulp powder is

				taken orally with coconut milk for 14 days to dissolve kidney stones
12.	*Amaranthus spinosus* (L.) (Amaranthaceae)	Spiny amaranth	Root or plant	1 cup of whole plant is taken
13.	*Amaranthus viridis* (L.) (Amaranthaceae)	Slender Amaranth, Green Amaranth.	All parts	Given in kidney stone
14.	*Argemone maxicana* (L.) (Papaveracea)	Slender Amaranth	Root	Root powder is given for burning urination
15.	*Ageratum conyzoides* (L.) (Asteraceae)	Goat Weed	Leaves	Leaf extract is given twice a day
16.	*Amaranthus caudatus* (L.) (Amaranthaceae)	Love-lies-bleeding	Leaves	Extract is given in kidney stone
17.	*Asphodelus tenuifolius* (Cav.) (Liliaceae)	Weed of fields	Leaves	Decoction of leaves
18.	*Apium graveolens* (Apiaceae)	Lavender	Flowers	Decrease cholesterol level, Condiment.
19.	*Achyranthes aspera* (L.) (Amaranthaceae)	Khaff-flower	Roots	Urolithiasis, urinary tract
20.	*Amni visnaga* (L.) (Apiaceae)	Khella	Whole plant	Urolithiasis, urinary tract
21.	*Barbarea vulgaris* (Brassicacaea)	Rocket	Roots & Leaves	For kidney stone
22.	*Berginia ligulata* (Saxifragaceae)	Pasanabheda	Rhizomes	Astringent. Diuretic, Lithontriptic
23.	*Beta vulgaris* (L.) (Amaranthaceae)	Garden beet	Roots	Urolithiasis, urinary tract
24.	*Bridolia montana* (Euphobiaceae)	Chikitsa silianam	Bark	Bark Astringent,Anthelminetic
25.	*Bridolia montana* (Euphobiaceae)	Sugar beet	Rhizomes	Daily two glass of rhizomes juice is given in kidney stone
26.	*Bombex ceiba* (L.)(Bombacaceae)	Cotton tree	Stem and bark	Given for urinary problems
27.	*Borhaavia difffusa* (Nyctagenaceae)	Hogweed, Punarnava	Root	Root decoction is given daily for one month in kidney stone
28.	*Blumea balsamifera* (Asteraceae)	Sambong	Flowering plant	Diuretic, common cold, urolithiasis expectorant, anti-diarrhel
29.	*Berberis vulgaris* (L.) (Berberidaceae)	barberry	Roots bark	Urolithiasis, urinary tract
30.	*Capsella Bursa-pastori* (Brassicaceae)	Shepherd's-purse	Entire plant	Diuretic, For bladder & kidney spasm
31.	*Cucumis sativus* (Cucurbitaceae)	Cucu	Leaves	Kidney stones, Emollient
32.	*Caesalpinia huga* (Caesalpinioceae)	Nicker nut	Root	Root Diuretic, Lithontriptic
33.	*Citrus japonica* (Rutaceae)	Celery	Whole plant	Antispasmodic, Eczema
34.	*Celosia argentla* (Amararanthacea)	Plumed cockscomb	Leaves or Stem	Diarrhoea, Eye troubles, Sore mouth
35.	*Chelidonium majus* (Papaveraceae)	Chel	Leaves	Diuretic, Antispasmodic, bitter
36.	*Cassia fistula* (L.) (Caesalpinioideae)	Golden shower tree	Fruit	Fruit powder is given with water for 3-4 month to expel the kidney stone
37.	*Ceropegia bulbos* (L.) (Asclepidaceace)	Caudiciform	Tubers	Decoction of tubers is used to remove urinary bladder stone
38.	*Chenopodium album* (L.) (Chenopodiaceae)	Lamb's Quarters	Leaves	Cokked leaves is given in urinary trouble
39.	*Coculus hirsutus*(L.) (Menispeermacea)	Cocculus Indicus	Leaves	Leaf dried powder is given during burning urination
40.	*Corbichonia decumdens* (Forrsk.) (Molluginacae)	Forssk	Leaves	Crushed leaves given orally
41.	*Costus speciosus* (koen.) (Costaceae)	Keukand	Tubers	Decoction of tubers orally for stones

42.	*Cynodon dactylon* (L.) (Poaceae)	Dog's tooth grass	Roots	Root decoction is given in case of urolithiasis
43.	*Chimaphila numbellata* (Cruciferae)	Prince's pine	Flower	Diuretic, Expectorant,Stimulant
44.	*Centella asiatica* (L.) (Umbelliferae)	Gotu kola	Whole plant	Urolithiasis, urinary tract
45.	*Curcuma longa* (Zingiberaceae)	Haldi	Rhizome	Diuretic, Choleretic, Hepatoprotective
46.	*Desmodium styracifolium* (Papilionaceae)	Osbeck	Rhizome	Roots Emmenagogue, Stomachic
47.	*Didymocarpus pedicellata*	Stone Flower	Leaves	Lithontriptic
48.	*Daucas carota*(L.) (Apiaceae)	Wild carrot	Rhizome	One glass juice is given for night to remove kidney stone
49.	*Digera Muricata* (L.) (Amaranthaceae)	Digera Muricata	Leaves	Once in a day for urinary complains
50.	*Diospyros melaoxylon* (Rox) (Ebenaceae)	Digera Muricata	Fruit and bark	Fruit is given in urinary disorders
51.	*Dolichos biflorus* (Leguminaceae)	Horse gram	Seeds	Diuretic, Astringent, Tonic
52.	*Dichrostachys cinerea* (L.) (Mimosaceae)	Bell mimosa	Roots	Urolithiasis, urinary tract
53.	*Elettaria cardamomum* (Zingiberaceae)	Cardamom	Seeds	Diuretic, Carmintive, Aromatic stimulant
54.	*Equisitum arvense* (Equisetaceae)	Horsetail	Seeds	Diuretic, Dropsy, Graval, Renal affection
55.	*Eleusine coracana* (Gaertn.) (Poaceae)	Finger millet	Grains	Urolithiasis, urinary tract
56.	*Fogonia bruguieri* (Umbelliferae)	Fagonia	Fruit	Diuretic, Mildly carminative
57.	*Ficus carica* (Moraceae)	Fig	Fruit, latex	Destroy urinary & gall Stone
58.	*Garcinia pictoria* (Guttiferae)	Tamal. Pers.	Leaves	Dropsical affection
59.	*Gynocardia odorata* (Flacourtiaceae)	Coffee Plum	Fruit	Fish poision, Insecticidal, Skin aliments
60.	*Gomphrena celosioidest* (Amaranthaceae)	Gomphrena Weed	Whole plant	Juice is given twice a day for ten days
61.	*Grewia flavescens* (A.Juss) (Tiliaceae)	Sandpaper Raisin	Root	Decoction of root powder to stop bleeding in urine
62.	*Homonoia riparia* (Lour.) (Ephorbiaceae)	Willow-Leaved Water Croton	Root	Urolithiasis, urinary tract
63.	*Hygrophila spinosa* (Acanthaceae)	Gokulakanta	Leaves	Strongly Diuretic
64.	*Herniaria hirsute* (L.) (Illecebraceae)	Hairy rupturewort	Whole plant	Urolithiasis, urinary tract
65.	*Ichnoccarpus frustescens* (L.) (Apocynaceae)	Black creeper	Root	Urolithiasis, urinary tract
66.	*Lavendula Officinalis* (Lamiaceae)	Ginger	Rhizomes	Stop bleeding, Ant rheumatism
67.	*Lantana camara* (L.) (Verbinaceae)	Big-sage	Leaves	Urolithiasis, urinary tract
68.	*Lawsonia inermis* (L.) (Lythraceae)	Henna	Leaves	Urolithiasis, urinary tract
69.	*Mentha piperita* (Lamiaceae)	Peppermint	Entire herb	Treatment in stone disease
70.	*Mimosa pudica* (Mimosaceae)	Touch-me-not	Leaves	Gravel, Urinary complaints
71.	*Musa paradensis* (L.) (Musaceae)	Banana	Ripe kernel juice	Urolithiasis, urinary tract
72.	*Ocimum* (Labiatae)	Holy Basil, tulsi	Leaves	Stomachic, antipyretic, alexipharmac,
73.	*Onosma bracteatum* (Boraginaceae)	Sedge	Leaves	Tonic, Demulcent, Diuretic, Spasmolytic
74.	*Olea europeae* (Oleaceae)	Olive	Oil	Treatment of kidney stone

75.	*Pavonia odorata* (Malvaceae)	Fragrant Swamp Mallow	Rhizomes, Leaves	Antipyretic, Stomachic, Refrigerent, dysentry
76.	*Pimpinella anisum* (Umbelliferae)	Anise	Fruit	Antispasmodic, Diuretic, Treatment of kidney stones
77.	*Pedalium murea* (Pedaliaceae)	Burra Gokhru	Fruits	Decoction of fruit is used for urinary complains
78.	*Phyllanthus niruri* (L.) (Euphorbiaceae)	bhumyamalaki	Whole plant	Urolithiasis, urinary tract
79.	*Phy1llanthus emblica* (L.) (Euphorbiaceae)	Gooseberry or amla	Seed Powder	Given to avoid burning urination
80.	*Plantago major* (L.) (Plantginaceae)	Greater plantain	Whole plant	Urolithiasis, urinart tract
81.	*Phyllanthus fraternus* (Webster.) (Euphorbiaceae)	Gulf leaf-flower	Whole plant	Plant extract is given orally for 3-4 day to dissolve the stones
82.	*Rosmarinus officinalis* (Lamiaceae)	Rosemary	Leaves	Relive menstrual cramps, increase, urine flow, and reduce kidney pain
83.	*Rubia cordifolia* (Rubiaceae)	Madder or Indian Madder	Leaves, Roots	Antidysentric,Antiseptic, Deobstruent
84.	*Rotula aquatica* (Lour.) (Borginaceae)	Machim	Root	Urolithiasis, urinary tract
85.	*Solanum surattence* (Solanaceae)	Yellow-Berried Nightshade	Roots	Root decoction is given for seven day
86.	*Santalum album* (Solanaceae)	White sandal	Oil	For urinary bladder
87.	*Solidago virgaurea* (Asteraceae)	Woundwort		kidney tonic
88.	*Tectona grandis* (Verbenaceae)	Teak	Wood	Urinary discharge
89.	*Theobroma cocao* (Malvaceae)	Cacoa	Seed	urinary tracts diseases
90.	*Tamarind indica* (Fabaceae)	Tamarindus	Fruits	For kidney and gall stone
91.	*Tinospora cordifolia* (Wild L) (Menispermaceae)	Guduchi	Stem	Crushed stem to expel the stone
92.	*Tribulus terrestis*(L) (Zygophyllaceae)	Puncture Vine	Leaves	Used in treatment of kidney stone
93.	*Tridex procumbens* (L.) (Asteraceae)	Coat buttons	Leaves	Leaf paste is given for kidney stone
94.	*Tubiflora Acaulis* (L.F.) (Acanthaceae)	Kuntze	Leaves	Leaf powder with water is given for urinary complains
95.	*Urgina maritime* (Asparagaceae)	Squill bulb	Bulb leaves	Diuretic
96.	*Urtica dioica* (Urticaceae)	Stinging nettles	Roots	Diuretic
97.	*Vernomia cineea* (Compositae)	Little iron weed	Leaves	Anthelmintic, Diarrhoea
98.	*Xanthium strumarium* (L.) (Asteraceae)	Woolgarie bur	Flower	Urolithiasis, urinary tract
99.	*Zingiber Officinale* (Zingiberaceae)	Ginger	Rhizomes	Stop bleeding, Ant rheumatism
100.	*Zea mays* (Poaceae)	Maize	Seeds Oil /Tassel	For bladder & Kidney spasm. Given orally to expel the stone

7. Allopathic medicines: [102-104] Depending on the result of 24 hour urine collection, there are different treatment options for different stone types. Now there is convincing evidence that by treating specific biochemical abnormalities, the recurrence rate can be reduced. The three most commonly used classes of medications for stone prevention are enlisted here.

List of synthetic drug used in treatment of stone diseases is given below in **Table 3**.

7.1Thiazide diuretics (*e.g.* Hydrochlorothiazide): are used to reduce urine calcium excretion, in patients with hypercalciuria.

7.2 Alkali (*e.g.* Potassium citrate): are used to increase the urinary citrate excretion in patients with hypocitriuria.

7.3 Allopurinol: is used to reduce uric acid synthesis and urinary excretion in patients which hyperuricaemia or hyperuricosuria.

7.4 Sodium cellulose phosphate (SCP): is used to restore normal calcium excretion by reducing intestinal calcium absorption. The SCP may induce hypermagnesiuria leading to increase saturation of CaOx due to reduced complexation of urinary oxalate by magnesium.

7.5 Penicillamine (Cuprimine): are often recommended if drinking more fluids does not control cystine formations.

7.6 Analgesic (Diclophenac sodium): For patients with ureteral stones expected to pass spontaneously tablets of diclophenac sodium 50 mg administered twice daily during 3-10 days, might be useful in the risk of recurrent pain.

7.7 Bisphosphonates: Decrease fasting calciuria and less marked decrease in 24-hr calciuria.

7.8 Potassium phosphate: Increase serum phosphate, increase urine phosphate and possible increase in urine pyrophosphate.

7.9 Oxalobacter Formigenes and other probiotics: Decrease oxalate excretion for Struvite stones, treatment of infection is mandatory and may be needed for long term.

TABLE 3: LIST OF SYNTHETIC DRUG USED IN TREATMENT OF STONE DISEASES [105]

S. no	Drugs	Category	Mechanism of action	Uses
1.	Amiloride (Midamor)	Diuretics	Na+ reabsorption in late distal tubule and collecting duct	Kidney diseases
2.	Allopurinol (Lupurin, Zyloprim)	Analogue of hypoxanthine	It inhibits xanthine oxidase and prevent the synthetic of urate from hypoxanthine and xanthine	Urinary infections, calculi
3.	Cholestyramine (Questran)	Bile acid sequestrates	Increases in hepatic LDL receptors. Inhibition of reductase activity by a statin	Kidney diseases
4.	Cholic acid	Bile acid derivatives	It induces bile flow, feedback inhibits cholesterol synthesis, promote intestinal excretion of cholesterol.	Gall stone diseases
5.	Digoxin (Lanoxin)	Cardiac glycoside	Inhibition of Na+, K+ ATPase	Ailments of kidney diseases
6.	Etidronate disodium	Bisphosphonate	It prevent hydroxyl apatite dissolution	Kidney stones
7.	Fluvastatin (Lescol)	Statin	Reduction of LDL levels. It competitive inhibits HMG-COA reductase	Gall stone diseases
8.	Gemfibrozil	Fibric acid derivatives	It reduces triglycerides through PPAR a – moderated stimulation of fatty acids oxidations	Gall bladder diseases
9.	Indinavir	Peptidomimetic hydroxyethylene HIV inhibitors	It reversely binds to the active site of HIV protease, prevent polypeptides processing	HIV diseases, Kidney diseases
10.	Zonisamide	Sulphonamide derivatives	It inhibits the T- type Ca^{2+} channel, repetitive firing of spinal cords neurons	Ailments of stone diseases

8. Researchers reported for stone dissolving activity:

1. Aqueous and alcohol extracts of *Jasminum auriculatum* Vahl (Oleaceae) flowers are reported for kidney stone. [106]
2. Aqueous of extracts of *Herniaria hirsuta* L. Are reported for nephrolethiasic. [107]
3. Ethanolic extracts of leaves of *hibiscus sabdariffa* Linn are used for kidney stone. [108]
4. The acute diuretic effect of the water extract of the aerial parts of *Retama raetam* (RR) are used for kidney ailments.[109]
5. The chronic diuretic effect of the water extract of the whole plant of *Spergularia purpurea* (SP) are used for kidney stone. [110]
6. Aqueous extracts *Rosmarinus officinalis* and *Centaurium erythraea* are used for kidney ailments. [111]
7. Ethanolic extract of *Ammannia baccifera* (Bhatjambol) was found to be effective in reducing the formation of urinary stones (prophylactic). [112]

8. *Crateva nurvala* (Varun) were found to possess significant anti-hyperoxaluric and anti-hypercalciuric activity. [113]

9. The Aqueous extracts *Sesbania grandiflora* are used for antiurolithiatic. [114]

10. The Aqueous extract of the bark of *Raphanus sativus* was tested for its antiurolithiatic and diuretic activity. [115]

9. Plants acting on Kidney stones: Various types of plants and its species are used in the treatment of kidney stones. The plants used for kidney problems are *Allium sativum, Apium graveolens, Armoracia lopathifolia, Barbarea vulgaris, Capsella bursapastori, Citrus japonica, Ficus carica, Olea europeae, Pimpinella anisum, Rosmarinus officinalis, Theobroma cacao, Chamaesyce hirta, Flemingia strobilifera, Peperomia rotundifolia, Petiveria alliacea, Nopalea cochinellifera, Apium graveolens, Cynodon dactylon, Eleusine indica, Gomphrena globosa, Pityrogramma calomelanos and Vetiveria zizanioides*. The genus *Phyllanthus* has a long history of use in the treatment of kidney stones. Some related species in this region with medicinal significance are *P. epiphyllanthus, P. niruri P. urinaria, P acuminatus and P. emblica. P. amarus, P. nururi and P. urinaria* are used in the treatment for kidney and gallstones.[116]

10. Plants acting on Gall stones: Different types of plants used in the treatment of gall stones are *Apium graveolens, Bauhinia cumanensis, Bauhinia excise, Costus scaber, Chamaesyce hirta, Cissus verticillata, Capraria biflora, Cocos nucifera, Eleusine indica, Ficus carica, Gomphrena globosa, Kalanchoe pinnata, Portulaca oleraceae, Solanum melongena*.[116]

11. Plants acting on Genito-urinary system: Plants and its species that are used in treatment of urinary stone are *Asalhagi gaecorum, Anduritica dioceia, Allium sativum, Gamphora globra, Elaegens angustifolia, Fleminfia strobilifera, Gomprena globosa, Justicia pectoralis, Lepianthes pelata, Momordica charantia, Nopalea cochenillifera*. [116]

12. Current aspects of medicinal plants in India: India has been referred to as the medicinal garden of the world. India comes under the 12 mega biodiversity centres having 45,000 plants species. In India around 20,000 medicinal plants species have been recorded, but around 500 traditional communities use 800 plant species for curing the diseases. Today around 50% of world population is totally depends upon the plant derived products as a primary health care with no side effects.[117]

13. Challenges and future aspects of medicinal plants: Today medicinal plants are very important for the growth of new drugs. People are using herbal drugs because of its safety, efficacy and lesser side effects. Plants and plant products have utilized with varying success to cure and prevent diseases. At present demand of natural plants derived products are increasing day by day in global countries. The significance of medicinal plants in national economy and its potential for the rapid growth of herbal products have been emphasizing frequently. [118]

CONCLUSION: As evident from the above discussion, nature is the best combinatorial chemist and has possible answers to all diseases for mankind. Medicinal plants play a vital role in stone diseases. The undesirable effect of the modern medicine has already diverted the attention of the people towards herbal medicines. To increase the acceptability and awareness among the people, there is an urgent need to develop trust and faith towards the safer indigenous system by establishing its validity in treatment for various diseases. Health care systems are going to become more and more expensive, therefore we have to introduce herbal medicine systems in our health care. Lets us hope that in future natural products will be competing modern medicines with added advantages of more safety and lower costs.

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