IMPORTANCE OF PLANTS IN THE MANAGEMENT OF RENAL CALCULI – A REVIEW

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ABSTRACT

Urolithiasis is a recurrent disorder predominant in males. The present day medical management of urolithiasis is either costly or not without side effects. Hence, the search for antilithiatic drugs from natural sources has assumed greater importance and playing a significant role in the management of renal calculi. The WHO has approved the use of traditional medicines as a part of its health programs. As in almost all the system of traditional medicines, plants play a major role and constitute its back bone. The management of urolithiasis is combined surgical and medical approach using percutaneous nephrolithotomy (PCNL), extracorporeal shock wave lithotripsy (ESWL) and antibiotics. These treatments are relatively costly, painful and require expert hands and availability of appropriate equipments. Ayurveda, an indigenous system of Indian medicine, offers vast scope for the successful treatment of urolithiasis. The administration of phyto formulations prevented the formation of urinary stones, supporting folk information regarding antiurolithiatic activity of the plant part. The mechanism underlying this effect is still unknown, but is apparently related to diuresis and lowering of urinary concentrations of stone forming constituents. Many plants playing a prominent role in the management of renal calculi.

KEYWORDS: Renal stones, Urolithiasis, Cystone, Medicinal plants.

INTRODUCTION

Plants based traditional systems of medicines are playing an important role in majority of countries for providing health care to large section of population.[1] It is an important fact that traditional systems of medicines always played an important role in meeting the global health
care needs. They are continuing to do so at present and shall play a major role in future also. Plant products as parts of food or botanical portions and powders have been used with varying success to cure and prevent diseases throughout history. Now-a-days natural products are an integral part of human health care system, because there is popular concern over toxicity and resistance of modern drugs.[2] India is one of the 12 leading biodiversity centers with presence of over 45,000 different plant species, 15000-18000 flowering plants, 23,000 fungi, 16,000 lichens, 18,000 bryophytes and 13 million marine organisms. From this flora, 15,000 to 20,000 have good medicinal value. Among those only about 7,000 plants are used in Ayurveda, 600 in Siddha, 700 in Unani and 30 in modern medicines. The global herbal products market is worth of US dollar 32 billion and is growing at a rate of about 9-15%.

Urolithiasis is a worldwide problem, sparing no geographical, cultural or racial groups. It is nothing but the development of stones in the urinary tract. It is a common disorder of the urinary tract and most painful of urologic disorders. It is considered as the third most common affliction of the urinary tract. It is a complex phenomenon yet not clearly understood. This cannot be contributed to any single factor and may be due to metabolic disturbances, infections, hormonal influences, dietary conditions and habits or obstructions in the bladder or kidney or increased excretion of stone forming components such as calcium, magnesium, oxalate, carbonate, phosphate, urate, cystine etc. The major factors are supersaturation of urine with the offending salt and crystallization. Crystals retained on kidney can become nucleus for stone formation. This process is synonymously known as urolithiasis or nephrolithiasis or renal stones or kidney stones.[3-8]

Calcium oxalate and calcium phosphate stones are the highest common calculi which form approximately 80% of stones in the urinary system. Uric acid stones represent about 5-10% trailed by cystine, struvite and ammonium acid urate stones. Endoscopic stone removal and extracorporeal shock wave lithotripsy (ESWL) are widely used to remove the calculi. However, in addition to the traumatic effects of shock waves, persistent residual stone fragments, and the possibility of infection, suggest that ESWL may cause acute renal injury, a decrease in renal function and an increase in stone recurrence. Therefore, it is worthwhile to look for alternative treatments by using medicinal plants or phytotherapy to replace these modern methods. Nutritional factors besides environmental and genetic factors are important lithogenic risk factors.[9-14]
The urinary tract system consists of the kidneys, ureters, bladder and urethra. The kidneys are two bean-shaped organs located below the ribs toward the middle of the back. The kidneys remove extra water and wastes from the blood, converting it into urine. They also keep a stable balance of salts and other substances in the blood. Narrow tubes called ureters carry urine from the kidneys to the bladder, a triangle-shaped chamber in the lower abdomen. Like a balloon, the bladder's elastic walls stretch and expand to store urine. They flatten together when urine is emptied through the urethra to outside the body.\[15-22\]

A kidney stone is a hard mass developed from crystals that separate from the urine and build up on the inner surfaces of the kidney. Normally, urine contains chemicals that prevent the crystals from forming. These inhibitors do not seem to work for everyone, however, so some people form stones. If the crystals remain tiny enough, they will travel through the urinary tract and pass out of the body in the urine without being noticed. Kidney stones may contain various combinations of chemicals. The most common type of stone contains calcium in combination with either oxalate or phosphate. These chemicals are part of a person's normal diet and make up important parts of the body, such as bones and muscles. A less common type of stone is caused by infection in the urinary tract. This type of stone is called a struvite or infection stone. A bit less common is the uric acid stone. Cystine stones are rare.\[23-29\]

Urolithiasis is the medical term used to describe stones occurring in the urinary tract. Other frequently used terms are urinary tract stone disorder and nephrolithiasis. For unknown reasons, the number of people with kidney stones has been increasing over the past 20 years. Stones occur more frequently in men. Kidney stones strike most typically between the ages of 20 and 40. Cystinuria and hyperoxaluria are two other rare, inherited metabolic disorders that often cause kidney stones. In cystinuria there is too much of the amino acid cystine, which does not dissolve in urine and it is voided. This can lead to the formation of stones made of cystine. In patients with hyperoxaluria, the body produces too much of the salt oxalate. When there is more oxalate that can be dissolved in the urine, the crystals settle out and form stones.\[30-34\]

**Literature Review**

Anand R et al., 1994 made a research on antiurolithiatic activity of *Tribulus terrestris* and *Crateva nurvala* in albino rats. The active constituent isolated from *Crateva nurvala* was lupeol and it was extensively studied. Antiurolithiatic activity of lupeol was assessed in rats by observing the weight of the stone, biochemical analysis of serum and urine and
histopathology of bladder and kidney. Lupeol not only prevented the formation of vesical calculi but also reduced the size of the preformed stones. They have concluded that lupeol having significant antiurolithiatic activity.

Atmani et al., 2003 had reported that Hibiscus sabdariffa Linn. has curative effect on stone formation induced by ethylene glycol. Joyamma V et al., 2003 had reported that Mimosa pudica having good antiurolithiatic property. Ravindra V K et al., 2006 made a study on Moringa oleifera root in the management of renal calculi.[35-42]

Bahuguna Y et al., 2009 revealed that Jasminum auriculatum flowers having effective antourolithiatic activity. The effect of this plant on calcium oxalate nephrolithiasis has been studied in male albino rats. Ethylene glycol feeding resulted in hyperoxaluria as well as increased renal excretion of calcium and phosphate. Supplementation with alcoholic and aqueous extract of Jasminum auriculatum flowers significantly reduced the elevated urinary oxalate, showing a regulatory action on endogenous oxalate synthesis. The increased deposition of stone forming constituents in the kidneys of calculogenic rats were also lowered by this extract treated groups. The result indicates that the flowers of Jasminum auriculatum is endowed with antiurolithiatic activity.

Jarald E et al., 2011 made a research work on Unex for its antiurolithiatic property. The study mainly focused to evaluate the effectiveness of Unex capsule on albino rats as a preventive agent against the development of kidney stones. Activity of Unex capsule was studied using the ethylene glycol-induced urolithiasis model and the research work proved that Unex capsule restored the urine pH to normal, and increased the the urine volume significantly.

Gilhotra U K et al., 2011 made a study on the effect of Rotula aquatic on ethylene glycol induced urolithiasis in rats. The alcoholic extract reduced the oxalate, calcium and phosphate in urine. It also increased the urine volume, thereby reducing the tendency for crystallisation. Anbu J et al., 2011 had made a study on antiurolithiatic activity of ethyl acetate root extract of Ichnocarpus frutescens using ethylene glycol induced method in rats. Supplementation with ethyl acetate extract of Ichnocarpus frutescens significantly reduced the elevated urinary oxalate, showing a regulatory action on endogenous oxalate synthesis. The increased deposition of stone forming constituents in the kidneys of calculogenic rats were also lowered.
by this extract treated groups. The result indicates that the root of *Ichnocarpus frutescens* is endowed with antiurolithiatic activity.

Ahmadi M et al., 2012 undergone a study on *Alcea rosea* root extract as a preventive and curative agent in ethylene glycol induced urolithiasis in rats. According to their research concept, *Alcea rosea* showed a beneficial effect in preventing and eliminating calcium oxalate deposition in the rat kidney. This effect is possibly due to diuretic and anti-inflammatory effects or presence of mucilaginous polysaccharides in the plant. It may also be related to lowering of urinary concentration of stone-forming constituents. Suganya P et al., 2012 made a research work on formulation and evaluation of capsule containing poly herbal ingredients as an antiurolithiatic agent.[43-48] Preformulation, formulation and inprocess quality control tests have been carried out and the product was significant in nature.

**DISCUSSION AND CONCLUSION**

The WHO has approved the use of traditional medicines as a part of its health programmes. According to a WHO survey, 80% of the population living in developing countries rely almost exclusively on traditional medicine for primary health care needs. As in almost all the system of traditional medicines, plants play a major role and constitute its back bone.

There are several options available in the management of ureteral stones. Treatment selection depends on stone size, location and composition, efficacy of each modality and associated morbidity, equipment available, physician skill, patient health and preference and finally costs. In many cases, the management of urolithiasis is combined surgical and medical approach using percutaneous nephrolithotomy (PCNL), extracorporeal shock wave lithotripsy (ESWL) and antibiotics. These treatments are relatively costly, painful and require expert hands and availability of appropriate equipments. For the treatment of larger renal stones these are effective but recurrence rate was high and having their own side effects. Endoscopic stone removal and extracorporeal shock wave lithotripsy (ESWL) leads to traumatic effects of shockwaves; persistent residual stone fragments and possibility of infection, some of the literatures suggest that ESWL may cause acute renal injury, decrease in renal function and increase in stone recurrence.[49] Allopurinol, Cystone etc are few drugs used in the treatment of renal calculi but these drugs are having there own side effects.

This has given rise to stimulation in the search for investigating natural resources showing antiurolithiatic activity. There was a tremendous advance in the field of medicine, but still
there is no truly satisfactory drug for the treatment of renal calculi. Most patients still have to undergo surgery to be rid of this painful disease. Ayurveda, an indigenous system of Indian medicine, offers vast scope for the successful treatment of urolithiasis. Plants and other natural substances have been used as the rich source of medicine. All ancient civilizations have documented medicinal uses of plant in their own ethnobotanical texts. The list of drugs obtained from plant source is fairly extensive. Many remedies have been employed during the ages to treat urolithiasis. Most of the remedies were taken from plants and proved to be useful, though the rationale behind their use is not scientifically established except for a few plants and some proprietary composite herbal drugs.[50]

In indigenous system of medicine, many plants are reported to be useful in the treatment of urinary calculi. Juice of various species of plants are used internally as a diuretic, analgesic, antidiabetic, anthelmintic, food supplement, antioxidant. Therefore the scope of this research work was the importance of phytotherapy for renal stones.[51]

The phytochemical investigation in many plants showed the presence of alkaloids, carbohydrates, glycosides, resins, proteins and amino acids, saponins, steroids and triterpenoids in alcoholic extract. The major phytoconstituents like lupeol, β-sitosterol, quercetin and gallic acid were detected and quantified by HPLC analysis. In conclusion, the presented data indicate that administration of phyto formulations prevented the formation of urinary stones, supporting folk information regarding antiurolithiatic activity of the plant part. The mechanism underlying this effect is still unknown, but is apparently related to diuresis and lowering of urinary concentrations of stone forming constituents.[52]

Plants like Musa species, Moringa olifera, Mimosa pudica, Rotula aquatic, Tribulus terresteris, Crateva nurvala, Jasminum auriculatum, Hibiscus sabdariffa, Alcea rosea etc playing an important role in the management of renal calculi.

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