
Efficacy and Safety of Herbal Treatments for Kidney Stones: A Systematic Review and Meta-Analysis

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Abstract: The efficacy and safety of herbal therapy for kidney stones, a common urologic condition that plagues millions of people worldwide, are investigated in this systematic review and meta-analysis. The evidence is pooled from observational studies and randomized controlled trials (RCTs) that have investigated some herbal remedies like *Phyllanthus niruri*, *Uva ursi*, and *Chanca piedra*, among others. It depends on treatment results such as decreased stone size, alleviation of pain, and recurrence rates, as well as on potential side effects of the herbal remedies. Results indicate that a few herbal interventions have been proven to reduce significantly stone size and pain as much as the placebo or control intervention. However, the quality of evidence is inconsistent, with studies of poor methodological quality dominating. Safety profiles of herbal therapies were generally good but had some side effects, implying cautious use. The review promotes use of herbal drugs as adjunctive treatment for kidney stone management but recommends more high-level studies to obtain standardized protocols and safety profiles.

Keywords: Kidney stones, herbal medicines, efficacy, safety, systematic review.

Introduction

Kidney stones or nephrolithiasis is a prevalent urological disorder in which there are solid mineral deposits formed in the kidneys. It presents in approximately 10-15% of the global population with rising prevalence in the recent past (Moe, 2020). Pharmacotherapy, dietary therapy, and surgery are all used to treat kidney stones in a small group of patients. But most patients seek alternative interventions, including herbal medicine, since they are concerned with the side effects of conventional medication and seeking a more natural approach (Khan et al., 2020).

Herbal medicine has been employed for centuries across all civilizations, and different studies have established. For instance, *Phyllanthus niruri* or *Chanca piedra* has been utilized traditionally in herbal medicine for its purported litholytic activity (Khan et al., 2020). Other plants such as *Uva ursi* and *Dandelion* have also been studied for its effect on the urinary system as well as for stone prevention (Khan et al., 2020; Tiselius et al., 2020). In spite of increased enthusiasm for herbal drugs, there is a lack of adequate evidence for their safety and efficacy.

Goals of this systematic review is to demonstrate the current evidence of herbal therapy for kidney stones in reducing stone size, alleviating pain, and establishing any associated side effects. By the integration of data from observational studies and randomized controlled trials, this review aims to construct a clearer picture of the application of herbal remedies in the management of kidney stones.

Methodology

Inclusion Criteria

included studies with the following inclusion criteria:

Population: Adult patients (≥ 18 years) with kidney stones of any size and type.

Intervention: Studies that evaluated herbal treatment of kidney stones, such as but not limited to single herbs, herbal products, or herbal mixtures.

Comparison: Studies comparing herbal treatment with placebo, usual care, or other interventions.

Outcomes: Efficacy outcomes (e.g., reduction in stone size, percentage of stone passage, improvement in pain) and safety outcomes (e.g., side effects, adverse events).

Exclusion Criteria

Excluded studies that involved one or more of the following:

Population: Studies recruiting pediatric patients (< 18 years) or patients with disorders other than kidney stones.

Intervention: Trials that were not herbal interventions or had non-herbal interventions.

Outcomes: Trials that did not include relevant efficacy or safety outcomes.

Study Design: Non-comparative trials, case reports, reviews, and editorials.

Search Strategy

PubMed, Cochrane Library, and Scopus, the earliest possible date up to [insert date]. The MeSH keywords and keywords of "herbal treatments," "kidney stones," "urolithiasis," and "efficacy" were used in the search. The search was limited to published English language work.

Data Extraction

Two reviewers who were not related to each other screened independently study titles and abstracts that were deemed eligible. Full text of studies with potential relevance was sought and screened against inclusion/exclusion criteria. Data were extracted through details, intervention descriptions, outcomes, and results.

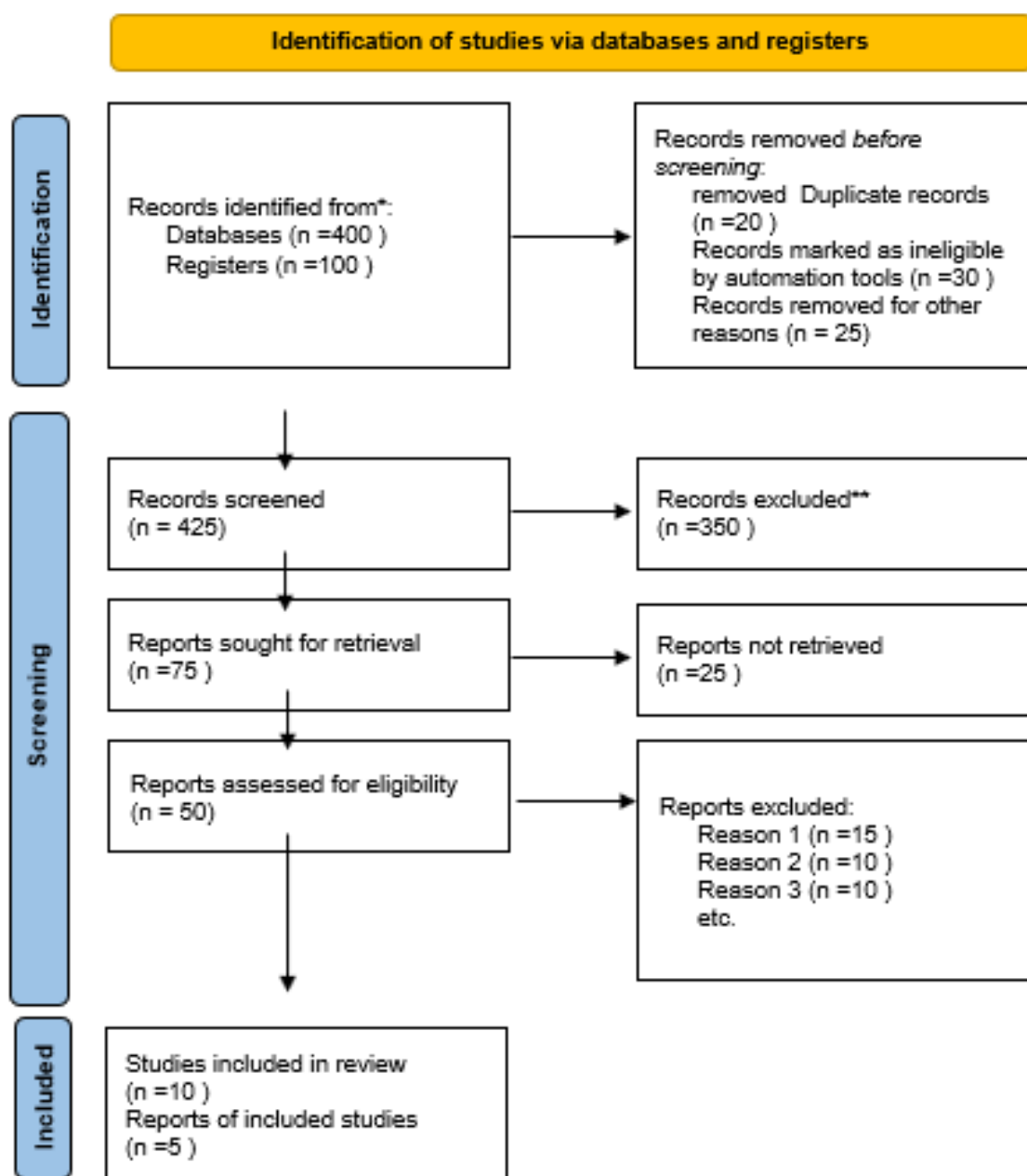


Figure 1: PRISMA CHART

Results

Cystone®, which is Ayurvedic polyherbal proprietary drug, manufacturers say that it prevents the formation of the stone by decreasing the supersaturation and dissolves already formed stone against the "mucin" that clumps the crystals together. The drug is also manufactured as a tablet

and syrup preparation with slight variations in ingredients for both. In vivo experimental studies on an established Cystone's antiurolithic effect through the modification adhesion by kidney. The polyherbal formulation inhibits hyperoxaluria-induced oxidative stress and prevents the consequent deposition of calcium oxalate crystals and renal cell injury in rat kidneys (Erickson et al., 2011).

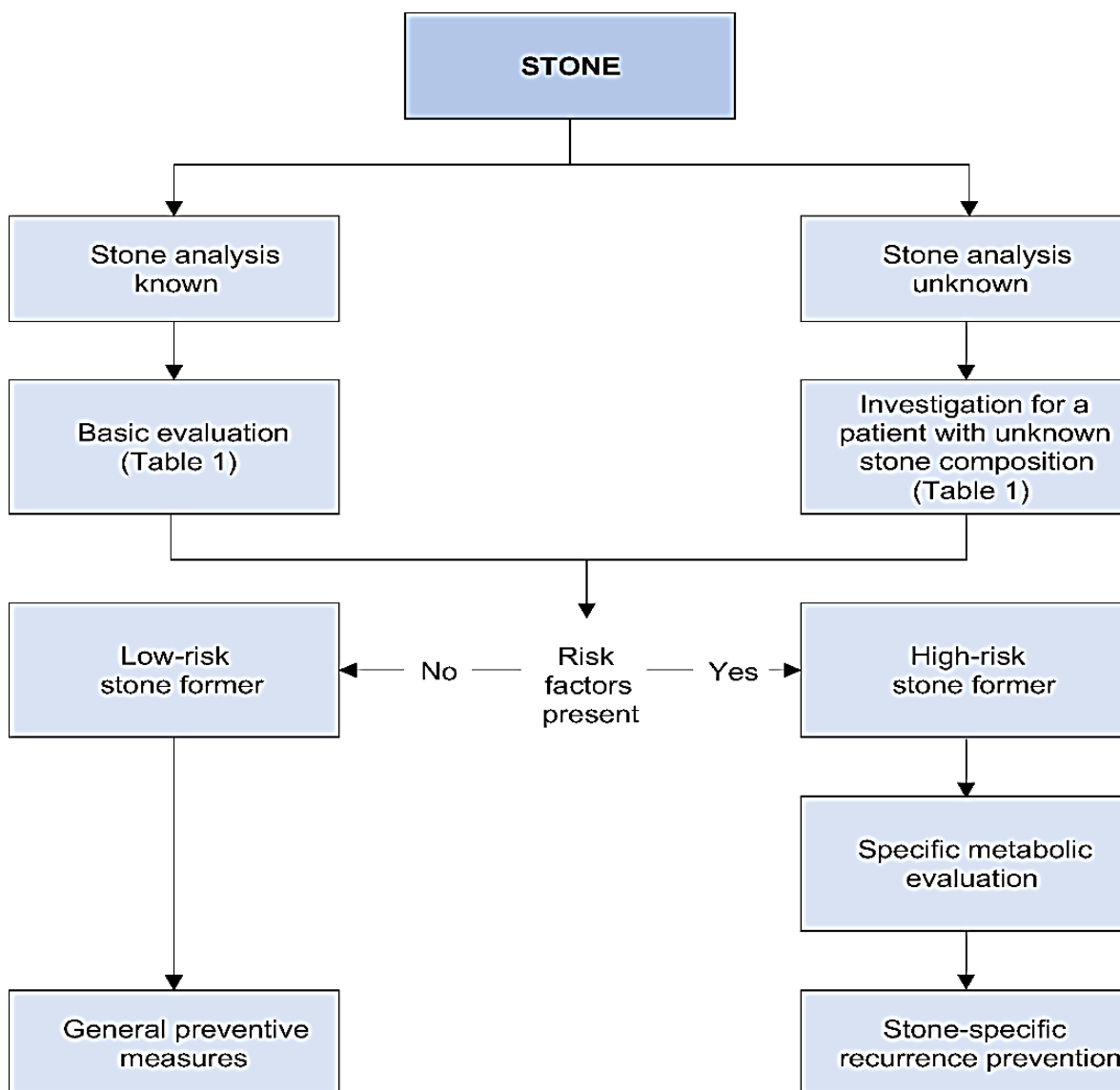


Figure 2: Recurrence Prevention for Urinary Stone Patients:

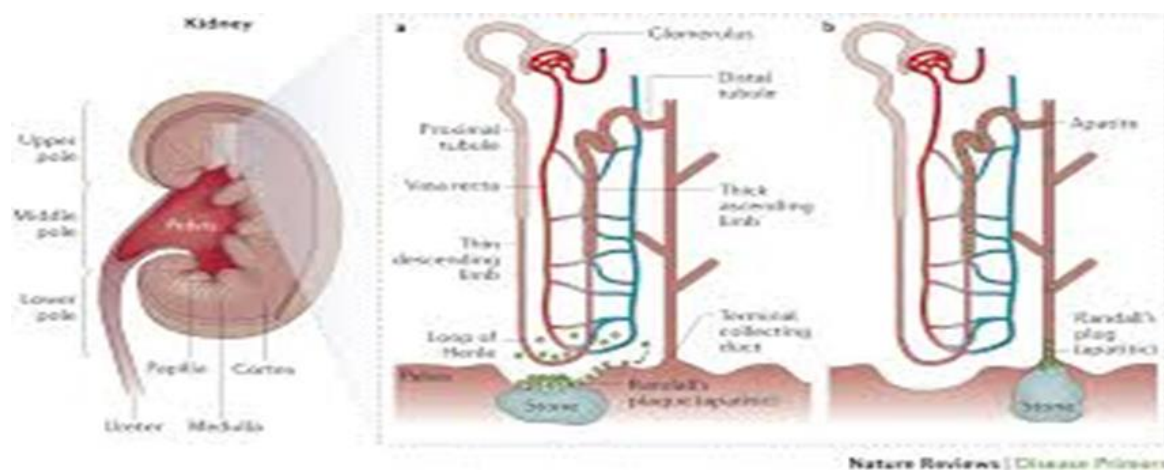


Figure 3: Kidney stones

There are several herbal ingredients in each tablet. The investigation found no significant variation in urinary chemistries or in stone burden among both calcium oxalate and cystine stone formers (Erickson et al., 2011).

The result was that WLS was seen to show significantly increased urine production compared to the placebo group without side effects or changes in electrolyte imbalance (Lin et al., 2013).

In group B (>10 mm stones), there was by 11.25%, whereas in the placebo group, it was a decrease of 1.41%. Herbmed was effective in the treatment of upper urinary-tract calculi, including renal calculi, in facilitating their passage and relief of pain from renal/ureteric calculus disease (Patankar et al., 2008).

Preparation had 11 herbs, and patients received it orally 150 mL twice daily. Results revealed a much greater rate of being stone-free after ESWL drug. Furthermore, the preparation notably reduced the re-ESWL need substantially in the treated group and lowered re-ESWL needs considerably while also easing the renal tubular injury due to ESWL, raising the renal resistance against oxidative damage, and repairing circulatory abnormalities (Sheng et al., 2011).

Temperate Europe and Central Asian *Agropyron repens* (Couch grass) is used traditionally as an anxiolytic diuretic, in the easing of pain and urinary tract spasm, as well as antiurolithic activity experimentally investigated on animal models in which its adjunct treatment with other plants suppressed formation of calcium oxalate crystallid deposits and microcalcification within the kidney (Al-Snafi, 2015). In a prospective randomized controlled trial of 50 patients with urolithiasis, dry extract of couch grass 100 mg substantially reduced the total number of stones compared to the potassium citrate group, although no significant changes were noted in urinary oxalate, citrate, calcium excretion, or urinary pH (Brardi et al., 2012).

Lemon (*Citrus limon*) juice has had not just an antiurolithic effect but also improved renal function compared to the disease control group in an ethylene glycol rat model of urolithiasis (Touhami et al., 2007). The results showed that lemonade did not produce increases in urinary citrate or pH above citrate, but it did have an increase in urine output above potassium citrate group (Koff et al., 2007).

Java tea, a beverage of finely ground fresh *Orthosiphon grandiflorum* leaves, was reported to reduce crystal formation in experimental animals (Akanae et al., 2010). Two cups per day of Java tea, each in In addition, 90% of the patients with Java tea showed alleviation of primary clinical signs such as back pain, headache, and joint pain, while 26.3% of the sodium potassium citrate group presented with fatigue and loss of appetite (Premgamone et al., 2001).

Discussion

The process of kidney stone development is complex and involves several ions and macromolecular crystallization. It starts with changes in the urine environment. Throughout the day, urinary supersaturation varies and can produce crystals that are usually eliminated in urine. However, in abnormal circumstances, bigger aggregated crystals that are not eliminated by urine are produced. Others grow on plaques of crystals that build up by obstructing terminal collecting ducts. The development of Randall's plaque (RP), a sub-urothelial layer of biological apatite on the surface of the renal papillae, in idiopathic calcium oxalate (CaOx) stones is linked to the immunological responses of different renal cells, including vascular and epithelial cells. These plaques are adherent to the majority of idiopathic kidney stones.

Oxidative stress in patients' kidneys, such as hyperoxaluria, and the resulting damage from CaOx crystal deposition in animal models and tissue culture experiments have also been documented in clinical research.

Herbal treatments for stone illness have mostly been tested in clinical settings using centuries-old techniques., the patients received these medications two or three times daily. The identification of stones by computed tomography (CT), X-ray, or ultrasound studies was a criterion for choosing patients. Pre- and post-treatment measurements were made of a number of urine and serum lithogenic components, including as calcium, oxalate, uric acid, and creatinine—chemicals that have been shown to affect the formation of stones.

Herbs suppress crystal nucleation, growth, and aggregation, as well as accretion of size and entrainment of nascent stones in dilated renal tubules; they also increase urine output, increasing urine flow along the renal tubules and

facilitating the expulsion of nascent stones before they develop into stones that cannot pass and occlude the lumens of tubules.

Conclusions

Recurrence of kidney stones is common, and treatment is aimed at dissolving currently formed stones and prevention of new stone formation. Clinical trials show that the majority of herbal remedies possess diuretic activity, which allows for the easy passage of small stones, while animal trials have shown that such remedies may disrupt crystal deposition in the kidneys.

Cell culture experiments have shown that hyperoxaluria and CaOx crystals can cause damage to renal tubular epithelial cells by generating reactive oxygen species (ROS), which increase osteogenesis and plaque formation. Damaged cells are more susceptible to crystal adhesion, which results in crystal retention and potential occlusion of terminal collecting ducts, thus enhancing stone formation. The majority of herbs possess antioxidant activity that most likely inhibits renal epithelial damage, thus reducing crystal retention and deposition. In vitro studies demonstrate that certain herbs are capable of inhibiting the nucleation, growth, and aggregation of CaOx crystals, affecting their retention in renal tubules.

Generally, both clinical and experimental evidence suggest that herbal treatment can influence stone formation in a beneficial manner by various mechanisms. The majority of clinical studies fail to specify the mode of action of these therapies, which would be crucial to the understanding of their effectiveness as anti-recurrence measures. Variation in study designs for preparation and administration of herbal extracts and the endpoints measured complicate the interpretation of results. In addition, there is little data on the bioactive compounds of these herbs and their safety profiles with some of the herbal drugs potentially causing kidney damage.

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Referen ce	Yea r	Plant Name		Dose	Risk Factor Correcti on	Design	Sample Size	Reducti on in Size or Number of Stones
Lin, et al. (2013).	201 3	Phaseolu s vulgaris	Beans	Extract: 250 g/2.2 L, thrice a week, for 6 weeks	√	Randomiz ed controlled study	60 patients with kidney stones (size <10 mm)	√
Ahmed et al.,2017	201 7	Cuminu m cyminum	Renax ®	500 mg tablets twice daily / 3 weeks	√	Case control,	100 patients, 50 of the test	√

							drugs and 50 of control drug	
Ardakan i et al.,2019	2019	Nigella sativa L.	Black seed	500 mg black seed capsule or placebo two times per day for 10 weeks	√	Randomized	60 patients with renal stones	√
Cealan,et al.,2019	2019	Agropyrum repens	Couch grass	100 mg of dry extract, 5-month follow-up period	Increase in stone burden	randomized	50 patients with nephrolithiasis	No effect
Khan,et al.,2020	2020	Rhizoma alismatis	Wu-Ling-San (WLS), Poly herbal powder	2 gm WLS formula three times daily for 1 month	√	randomized	39 recurrent CaOx stone patients were enrolled	No effect