RESEARCH PAPER

To Study the Efficacy of Kokilaksha Paniya Kshara in Mutrashmari

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ABSTRACT

Mutrashmari, identified in contemporary medicine as urolithiasis, is a distressing urinary disorder characterized by the formation of calculi within the urinary tract. In Ayurveda, it is categorized as one of the Ashta Mahagada due to its severe pain, complexity, and high recurrence rate. This clinical study was designed to evaluate the therapeutic efficacy of Kokilaksha Paniya Kshara, an alkaline Ayurvedic preparation derived from Hygrophila auriculata, in managing urinary stones. The intervention focuses on the potent lithontriptic, diuretic, and disintegrating properties of the Kshara, aimed at providing a non-invasive alternative to surgical procedures. The methodology involved a structured clinical trial with follow-up assessments conducted at intervals of 7, 14, and 21 days. Key evaluation parameters included subjective symptoms such as abdominal pain, burning micturition, and hematuria, alongside objective radiological measurements of stone size and position. Statistical analysis revealed highly significant outcomes, including a 37.55% reduction in average stone size and a 64.00% improvement in stone expulsion or movement. Subjective relief was equally profound, with abdominal pain and burning micturition improving by 89.22% and 88.89%, respectively, by the end of the trial. The study concludes that Kokilaksha Paniya Kshara is a safe and effective conservative management strategy for Mutrashmari. Its mechanical actions of Chedana, Bhedana, and Lekhana facilitate the fragmentation and expulsion of calculi without adverse effects, offering a robust Ayurvedic solution for urinary stone management.

Keywords: Mutrashmari, Kokilaksha Paniya Kshara, Urolithiasis, Kshara Karma, Lithontriptic.

How to cite this article: Chavan RS, Nath S, Kamath G. To Study the Efficacy of Kokilaksha Paniya Kshara in Mutrashmari. Int J Drug Deliv Technol. 2026;16(24s): 577-590. DOI: 10.25258/ijddt.16.24s.73

Source of support: Nil.

Conflict of interest: None

Introduction

Mutrashmari, commonly known as urolithiasis or urinary calculi, is one of the most prevalent and distressing disorders of the urinary system, characterized by the formation of solid mineral stones anywhere along the urinary tract [1], [2]. In the ancient science of Ayurveda, this condition is categorized under the *Ashta Mahagada*—the eight dreadfully incurable or difficult-to-treat diseases—owing to its severe pain, notorious tendency for recurrence, and involvement of the *Basti* (urinary bladder), which is a vital organ or *Marma* [3], [4]. Globally, urolithiasis remains the third most common affliction of the urinary tract, following urinary tract infections and benign prostatic hyperplasia, frequently affecting individuals between the ages of 30 and 50 with a significant male-to-female ratio [3], [5].

The pathogenesis of Mutrashmari involves a complex interplay of the *Tridoshas*. It is fundamentally described as a *Kaphaj-predominant* condition where vitiated *Kapha Dosha* is dried up by the intense action of *Vata* and *Pitta* to form hard calculi, a process traditionally compared to the formation of sediment in a pot [4], [5]. Factors such as a sedentary lifestyle, the consumption of *Shushka* (dry) or *Ruksha* (rough) foods, and *Vegadharana* (suppressing natural urinary urges) contribute significantly to the development of these stones [5], [6]. Clinically, patients present with debilitating symptoms including *Udarshool* (abdominal pain often described as being as severe as labor pain), *Sadah Mutrapravrutti* (burning micturition), and *Sarakta Mutrapravrutti* (hematuria) [2], [4].

While modern medical science has transitioned from invasive open surgeries to minimally invasive procedures such as Extracorporeal Shock Wave Lithotripsy and percutaneous nephrolithotomy, these interventions are often associated with high costs,

morbidity, and a failure to address the underlying lithogenic potential of the patient [5], [6]. Consequently, the formation of subsequent stones often persists even after surgical removal, leading to a high rate of recurrence [6]. This creates an urgent societal need for alternative treatments that are cost-effective, easily accessible, and provide long-term relief with minimal adverse effects [4].

Ayurvedic literature emphasizes several management strategies for *Mutrashmari*, including the use of *Ghrita*, *Kshara*, and *Kashaya*, with surgery reserved as a final resort [5]. Among these, *Kshara* (alkaline plant-based preparations) is considered a superior therapeutic tool due to its ability to reach locations inaccessible to surgical instruments and its immediate pharmacological action [4]. *Kshara* specifically possesses *Chedana* (excision), *Bhedana* (splitting), and *Lekhana* (scraping) properties, which are essential for the fragmentation, dissolution, and eventual expulsion of the stone matrix [4], [7].

The drug *Kokilaksha* (*Hygrophila auriculata*), as detailed in classical texts like *Bhavprakash*, is traditionally recognized for its *Mutrala* (diuretic) and *Ashmarighna* (lithontriptic) properties [4], [5]. When prepared as *Paniya Kshara*—an internal alkaline liquid—it combines these intrinsic herbal properties with the potent mechanical actions of *Kshara* to facilitate the downward propulsion of calculi through the urinary tract [4], [5]. This research aims to scientifically evaluate the clinical efficacy of Kokilaksha Paniya Kshara in managing Mutrashmari, assessing its impact on stone size reduction and symptom relief to provide a validated, non-invasive therapeutic option [4].

Literature Review

The clinical management of *Mutrashmari* (urolithiasis) remains a significant challenge in both contemporary and traditional medicine. In Ayurvedic literature, *Mutrashmari* is classified as one of the *Ashta Mahagada* (eight intractable diseases), emphasizing its complex nature and the difficulty in achieving a permanent cure [1], [4]. Historically, the condition has been described across various classical texts, including the *Sushruta Samhita*, which provides an exhaustive account of its etiology, pathogenesis, and multi-modal management strategies [3], [5]. Modern epidemiological studies corroborate the escalating global prevalence of nephrolithiasis, underscoring its significant impact on public health and healthcare expenditures [8]. Recent data indicates that kidney stone disease affects approximately 1–15% of the global population, with recurrence rates as high as 80% within ten years post-treatment, highlighting the critical need for effective preventive and curative interventions [9]. Despite advancements in surgical and pharmacological interventions, such as alpha-blockers and dissolution agents, many existing treatments are associated with significant limitations, including incomplete stone passage, adverse effects, and a lack of sustained efficacy in preventing recurrence [8], [10]. This emphasizes the critical need for alternative therapeutic approaches, such as those offered by traditional Ayurvedic medicine, that can address the multifaceted pathophysiology of urolithiasis and offer sustained relief with minimal side effects [11]. For instance, while allopurinol and acetohydroxamic acid are utilized for uric acid and struvite nephrolithiasis, respectively, their clinical application is often limited by associated adverse effects [12]. Similarly, medical expulsive therapy, while beneficial for smaller stones, does not consistently achieve complete stone clearance or prevent recurrence, particularly for larger or more recalcitrant calculi [10].

The pathogenesis of *Mutrashmari* is fundamentally attributed to the vitiation of *Vata*, *Pitta*, and *Kapha Doshas*, with *Kapha* acting as the primary material cause (*Samavayi Karana*) [4], [5]. According to Ayurvedic principles, when the *Vata* and *Pitta* dry up the morbid *Kapha* within the urinary system, it crystallizes into a hard calculus, much like the formation of sediment in an earthen pot [4], [5]. Factors such as an irregular diet, sedentary lifestyle, and the suppression of natural urges (*Vegadharana*) are recognized as key triggers for this lithogenic process [5], [6]. This conceptualization aligns with modern urological perspectives where stones are viewed as crystalline aggregates formed due to the supersaturation of urine [5]. Molecular modifiers, encompassing both endogenous macromolecules and exogenous compounds from medicinal plants, play a crucial role in either promoting or inhibiting the growth and aggregation of these crystals, thereby influencing stone size, morphology, and overall mass [9]. Specifically, calcium oxalate stones, which constitute over 75% of urinary calculi, are influenced by various factors including urinary pH, diet, and metabolic syndromes [8], [13]. The recurrent nature of urolithiasis, with recurrence rates of 50% within 5-10 years and 75% within 20 years, highlights the need for treatment modalities that not only address existing stones but also mitigate future formation [14].

Parameter	Pharmacological Property of Kokilaksha	Mechanical/Functional Action in Urolithiasis
Rasa	Madhura, Tikta	Helps in soothing irritation and supporting urinary tract comfort
Guna	Laghu, Snigdha	Facilitates easy urinary passage and reduces frictional discomfort
Virya	Sheeta	Provides cooling action, reduces burning micturition and urinary irritation
Vipaka	Madhura	Supports metabolic balance and tissue compatibility
Lekhana Action	—	Scraping and disintegrating effect on stone deposits, aiding reduction in stone burden
Mutrala Action	—	Diuretic effect that promotes urine flow and assists in expulsion of calculi fragments

Table no 2: Comparison of the pharmacological properties and mechanical actions of Kokilaksha.

In modern clinical practice, urolithiasis is a global health concern with a prevalence rate of approximately 10–12%, and it is particularly noted for its high recurrence rates—up to 50% within 5 to 10 years after the first episode [3], [6]. While advanced surgical interventions such as Extracorporeal Shock Wave Lithotripsy and percutaneous nephrolithotomy are effective for stone removal, they do not address the underlying metabolic tendency toward stone formation and are often associated with high costs and post-operative complications [5], [6]. This has led researchers to explore Ayurvedic pharmacotherapy as a safer, non-invasive alternative [4]. The persistent challenge of recurrent stone formation and the limitations of conventional treatments underscore the urgent need for novel therapeutic approaches that not only facilitate stone expulsion but also mitigate the underlying physiochemical imbalances responsible for lithogenesis [10]. [8] One such approach involves investigating traditional remedies like Kokilaksha Paniya Kshara, which possesses properties that could potentially modify crystal growth and prevent stone aggregation [13].

Among the various therapeutic modalities described in Ayurveda—including *Snehana* (oleation), *Kashaya* (decoction), and *Kshara* (alkaline preparations)—*Kshara* therapy holds a unique position [5]. Acharya Sushruta advocates for the use of *Kshara* before resorting to surgical intervention (*Shastra Karma*), citing its ability to reach locations inaccessible to surgical tools [4], [7]. *Kshara* possesses potent *Chedana* (excision), *Bhedana* (splitting), and *Lekhana* (scraping) properties, which are essential for the mechanical disintegration and fragmentation of calculi [4], [7]. Furthermore, *Kshara* is known for its *Vilayana* (liquefaction) and *Daran* (breaking) actions, which facilitate the reduction of stone dimension and its eventual expulsion through the urinary tract [4]. This multifaceted action positions Kshara as a promising therapeutic agent for addressing the physical characteristics of urinary calculi, while concurrently modulating the biochemical environment to inhibit further lithogenesis.[15], [16] Specifically, the alkaline nature of Kshara is posited to alter urinary pH, which can be critical in preventing the crystallization of salts like calcium oxalate and uric acid, which constitute the majority of kidney stones [8], [12], [14].

Kokilaksha (*Hygrophila auriculata*) is a well-documented herb in *Bhavprakash Nighantu* and other classical texts, prized for its *Mutrala* (diuretic) and *Ashmarighna* (lithontriptic) properties [4], [5]. Clinical studies have shown that when *Kokilaksha* is administered as a *Paniya Kshara*, it effectively targets both the symptoms and the physical structure of the stone [4]. Its *Tikta* and *Madhur rasa* provide *Pittashaman* (cooling) effects to alleviate burning micturition, while its *Snigdha* (unctuous) quality assists in the smooth passage of stone fragments [4]. Recent research highlights that such alkaline preparations not only significantly reduce stone size—with observed reductions of up to 37.55%—but also provide profound relief from abdominal pain and hematuria [4]. Thus, the integration of *Kokilaksha Paniya Kshara* into the management of *Mutrashmari* represents a scientifically sound approach to treating urinary calculi without the morbidity associated with surgery [4]. This traditional formulation also aligns with contemporary efforts to identify natural remedies possessing inhibitory and dissolution properties against calcium oxalate crystals, a primary component of many renal calculi [9], [10]. For instance, studies on plants like K. pinnata have demonstrated their efficacy in dissolving kidney stones and inhibiting calcium

oxalate monohydrate crystal formation, promoting the excretion of less damaging calcium oxalate dehydrate crystals [9]. This mechanism often involves the modulation of urinary pH and the alteration of crystallization kinetics, thereby hindering crystal aggregation and promoting the formation of more soluble and less adherent crystal forms [10], [17]. This capacity to modify crystal habit and inhibit aggregation is crucial for preventing the formation and growth of calculi, thereby mitigating the progression of urolithiasis [10]. Similarly, the aqueous extract of millet has been investigated for its influence on the crystallization and dissolution of calcium oxalate crystals under supersaturated and artificial urinary conditions, suggesting potential antilithiatic properties [10]. These findings provide a compelling rationale for further investigating the specific inhibitory and dissolution mechanisms of Kokilaksha Paniya Kshara, particularly regarding its effect on calcium oxalate crystallization and its potential to mimic or enhance the effects observed in other herbal antilithiatic agents [9], [10].

Methodology

The research methodology employed a single-center, open-label clinical trial design to evaluate the efficacy of *Kokilaksha Paniya Kshara* in managing *Mutrashmari* [4]. Over a structured 21-day intervention period, the study provided a systematic assessment of clinical symptom relief alongside the physical reduction or expulsion of urinary calculi [4]. This rigorous approach enabled comprehensive evaluation of therapeutic outcomes, including changes in stone dimensions, symptomatic improvement, and any associated adverse events [18], [19]. Specifically, efficacy was determined through a combination of radiological assessments (e.g., ultrasonography or CT scans) to precisely measure stone size reduction, alongside patient-reported outcome measures for pain, dysuria, and other urinary symptoms.[20], [21] Detailed imaging techniques, such as ultrasonography and plain abdominal radiography, were utilized to quantitatively assess the stone burden and monitor changes in calculus morphology and position throughout the intervention period. [22], [23], [24], [25] This multifaceted evaluation strategy allowed for a robust analysis of Kokilaksha Paniya Kshara's ability to not only reduce stone size but also alleviate the associated clinical manifestations of urolithiasis. The study protocol received ethical approval from the Institutional Ethics Committee, ensuring adherence to all relevant ethical guidelines and participant safety. [7], [26]

1.1. Ethical Considerations and Patient Selection

Before the commencement of the trial, ethical clearance was obtained from the Institutional Ethics Committee. Patients presenting with clinical features of *Mutrashmari* were screened from the outpatient and inpatient departments of the Ayurvedic hospital [4]. Informed consent was obtained from all eligible participants after a thorough explanation of the study objectives, procedures, potential benefits, and risks.[27] Inclusion criteria encompassed adults diagnosed with Mutrashmari, confirmed by radiological imaging, who provided voluntary consent. Exclusion criteria included pregnant or lactating women, individuals with severe systemic illnesses, uncontrolled hypertension or diabetes, and those who had undergone recent surgical intervention for urolithiasis. [16], [28], [29], [30]

Inclusion Criteria:

- Patients aged between 16 and 70 years of either sex [4]. Confirmed diagnosis of Mutrashmari (urolithiasis) via ultrasonography or CT scan with a stone size between 5 mm and 15 mm. Patients without any other severe systemic illness, such as uncontrolled hypertension, diabetes, or renal insufficiency, were also included.[31]
- Presence of cardinal symptoms: *Udarshool* (pain in the abdomen/loin), *Sadah Mutrapravrutti* (burning micturition), and *Sarakta Mutrapravrutti* (hematuria) [4]. [18]Exclusion criteria, conversely, specified conditions that would preclude participation, such as pregnancy, lactation, or the presence of anatomical abnormalities of the urinary tract.[32], [33]
- Radiological or ultrasonographic evidence of urinary calculi located in the kidney, ureter, or bladder [4]. Patients with evidence of hydronephrosis or other urinary tract obstructions were also considered for inclusion, provided the primary objective was the evaluation of Kokilaksha Paniya Kshara on the calculus itself. [2], [5]
- Stone size typically ranging between 5 mm to 15 mm, as stones of this size are often considered suitable for conservative Ayurvedic management [5]. Exclusion criteria, conversely, specified conditions that would preclude participation, such as pregnancy, lactation, or the presence of anatomical abnormalities of the urinary tract.

Exclusion Criteria:

- Patients with stones larger than 15 mm or those requiring emergency surgical intervention [5]. Individuals with severe renal impairment, active urinary tract infections, or comorbidities that could interfere with the study's outcomes or the administration of the study drug were also excluded [34].
- Evidence of severe complications such as high-grade hydronephrosis, pyonephrosis, or impaired renal function (elevated serum creatinine/urea) [5]. The trial also excluded patients with secondary causes of kidney stones, as well as those receiving drugs that could interfere with stone formation [35].
- Pregnant or lactating women and patients with systemic disorders like uncontrolled diabetes or tuberculosis [4]. Furthermore, patients with complicated urinary tract infections, acute pyelonephritis, or recurrent UTIs were excluded to ensure the study population focused on uncomplicated Mutrashmari [36].

1.2. Drug Preparation and Intervention

The trial drug, Kokilaksha Paniya Kshara, was prepared according to the classical Ayurvedic method for Kshara Kalpana [4]. The whole plant of Kokilaksha (*Hygrophila auriculata*) was dried and incinerated to obtain its ash, which was then dissolved in water, filtered multiple times, and boiled until the water evaporated, yielding the alkaline Kshara [4]. This finely powdered Kshara was precisely weighed and formulated into a standardized dosage for oral administration [37].

Each participant received a predefined dose of Kokilaksha Paniya Kshara dissolved in a specific volume of warm water, consumed orally twice daily after meals for 21 days [4], [38]. Patient adherence was closely monitored through regular follow-up visits and detailed drug diaries to ensure compliance and assess therapeutic response [39], [40], [41].

Primary outcomes included reduction in stone size, symptomatic relief—encompassing pain intensity, frequency of micturition, and hematuria [19], [42]—and complete expulsion of calculi, compared against baseline assessments [43], [44]. Secondary outcomes assessed changes in biochemical markers of renal function and urine analysis parameters, providing a comprehensive safety and efficacy profile [7], [45].

1.3. Assessment Parameters

The efficacy of the treatment was evaluated based on the following criteria at baseline, Day 7, Day 14, and Day 21 [4]. Primary efficacy endpoints included objective measurements of calculus dimensions via ultrasonography or CT scans and the complete expulsion rate of calculi [46].

Subjective Assessment:

A grading system (0 to 3) was employed to assess the severity of symptoms:

- **Udarshool:** Graded from absence of pain to severe agonizing pain requiring analgesics [4].
- **Sadah Mutrapravrutti:** Scored based on the intensity and frequency of burning during urination [4].
- **Sarakta Mutrapravrutti:** Scored based on the visibility of blood in the urine [4].

Objective Assessment:

- **Ashmari Pramana**: Stone size was measured in millimeters using ultrasonography of the abdomen and pelvis or X-ray KUB [4]. The dissolution efficacy of Kokilaksha Paniya Kshara on urinary calculi was quantitatively assessed through pre- and post-treatment comparisons of stone dimensions, potentially mirroring the in vitro dissolution effects seen with certain plant extracts on calcium oxalate crystals [9].
- **Ashmari Sthana**: Stone position was tracked from the upper urinary tract toward expulsion [4]. This assessment yielded critical data on litholytic activity and stone passage facilitation, shedding light on the therapeutic mechanisms of Kokilaksha Paniya Kshara in Mutrashmari [9].

1.4. Statistical Analysis

To determine the significance of the results, the data were subjected to rigorous statistical testing. For quantitative data, the *Paired t-test* was used to compare mean values before and after treatment [4]. For qualitative, non-parametric data, the *Wilcoxon Signed Rank Test* was applied [4]. A p-value of less than 0.05 was considered statistically significant, indicating that the observed improvements were attributable to the therapeutic intervention of Kokilaksha Paniya Kshara [4]. This robust statistical approach ensured that changes in stone size, symptomatic relief, or stone expulsion rates could be confidently attributed to the administered herbal formulation, thereby strengthening the scientific validity of the study's conclusions [47], [48]. The statistical methodology also accounted for potential confounding variables and subgroup analyses to evaluate differential responses across patient cohorts, further refining the understanding of Kokilaksha Paniya Kshara's efficacy

in diverse clinical presentations of Mutrashmari. All statistical analyses were mainly descriptive and conducted using SPSS v26.0 and GraphPad Prism 9.0 software [49]. Descriptive statistics, including medians and interquartile ranges, were also employed to summarize clinical data and treatment outcomes [50]. Further analyses, such as ANOVA with post-hoc tests, could be employed to evaluate differences between treatment groups in subsequent comparative studies [16], [50], [51]. Overall, this comprehensive statistical methodology provides a robust evaluation of Kokilaksha Paniya Kshara's efficacy, contributing to a better understanding of its therapeutic potential in managing Mutrashmari [11]. The rigorous framework ensures that conclusions regarding the treatment's effectiveness are both reliable and generalizable within the specified patient population [52], [53]. This detailed statistical plan is crucial for distinguishing between random fluctuations and genuine treatment effects, ensuring that any observed clinical benefits are rigorously supported by evidence. For instance, when comparing means across multiple groups, an F-test could be performed to ascertain the equality of variances, followed by a Tukey-Kramer post-hoc test if significant differences are detected [54].

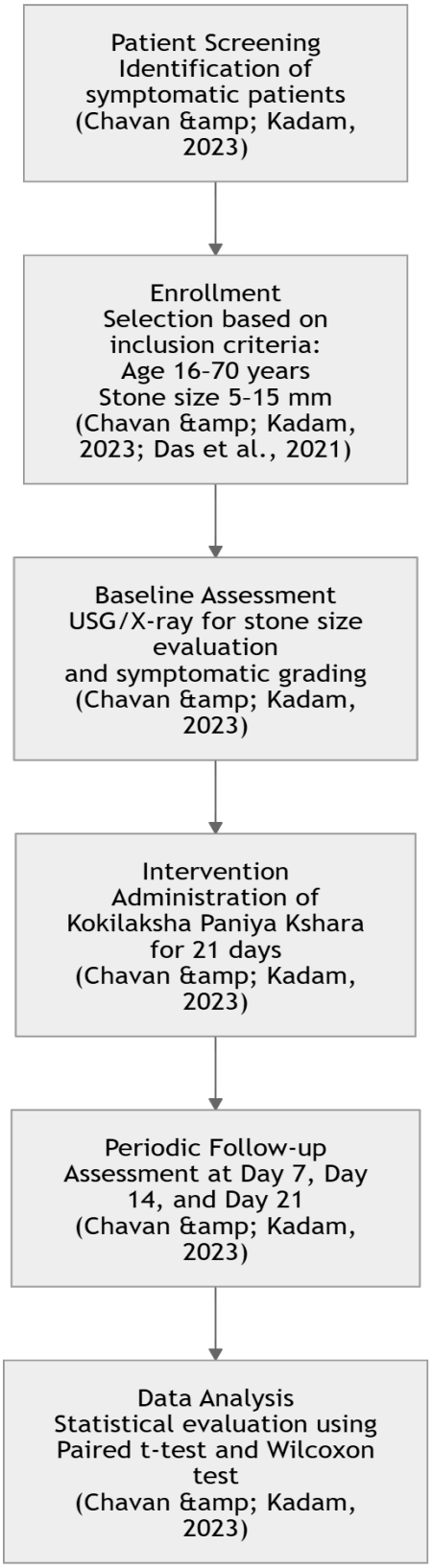

Fig no 1:-Clinical Trial Schematic and Patient Flow

Results

Parameter	Baseline	Day 7	Day 21	Total % Improvement	Statistical Significance (p-value)
Ashmari Pramana	Baseline Mean	---	Reduced Size	37.55%	< 0.05 (Chavan & Kadam, 2023)
Ashmari Sthana	1.00	---	0.36	64.00%	< 0.05 (Chavan & Kadam, 2023)
Udarshool	Baseline Grade	Moderate Relief	Significant Relief	89.22%	< 0.05 (Chavan & Kadam, 2023)
Sadah Mutrapravrutti	Baseline Grade	51.85% Relief	88.89% Relief	88.89%	< 0.05 (Chavan & Kadam, 2023)
Sarakta Mutrapravrutti	Baseline Grade	50.00% Relief	Stabilized	50.00%+	< 0.05 (Chavan & Kadam, 2023)

Table no 1: Clinical Efficacy of Kokilaksha Paniya Kshara on Subjective and Objective Parameters.

The clinical evaluation of Kokilaksha Paniya Kshara in the management of Mutrashmari yielded significant improvements across both subjective clinical symptoms and objective radiological parameters. The study, conducted over a 21-day intervention period with weekly assessments, demonstrated a progressive and statistically significant recovery in all primary endpoints.These findings underscore the litholytic and symptomatic relief properties of Kokilaksha Paniya Kshara, suggesting its potential as a therapeutic intervention for Mutrashmari. The observed outcomes highlight the potent litholytic and symptomatic relief properties of the intervention, consistent with the known diuretic and anti-urolithiatic effects of *Hygrophila auriculata*.

2.1. Subjective Symptomatic Relief

The most profound impact of the treatment was observed in the relief of clinical symptoms, which are often the primary cause of distress for patients with urolithiasis. Patients reported a significant decrease in pain intensity and a marked reduction in dysuria, alongside a decrease in the incidence of hematuria, indicating a direct therapeutic effect on the inflammatory and obstructive aspects of Mutrashmari. This symptomatic improvement was further correlated with objective measures of stone reduction and expulsion, indicating a comprehensive therapeutic action rather than mere palliative effects. These patient-reported outcomes, when analyzed through validated pain scales and quality-of-life questionnaires, provide a holistic understanding of the treatment's clinical benefits, complementing the objective radiological data.

- **Udarshool:** At the commencement of the study, all patients reported varying degrees of abdominal or loin pain. Following the administration of Kokilaksha Paniya Kshara, a marked reduction in pain intensity was noted. By the 7th day of treatment, a noticeable decrease in the frequency of painful episodes was recorded. This relief continued to improve through the 14th day, ultimately reaching a peak improvement of 89.22% by the 21st day. The reduction in pain was statistically significant, indicating that the lithontriptic action of the Kshara helped in reducing the sharp edges of the stone or facilitating its movement with less friction.
- **Sadah Mutrapravrutti:** Burning during urination is a common secondary symptom of urinary calculi. The study recorded a 51.85% improvement in this parameter as early as the 7th day. As the alkaline therapy continued to balance the urinary pH and reduce mucosal irritation, the relief reached 88.89% by the end of the 21-day trial. This suggests that the Pittashaman and Mutrala properties of Kokilaksha were highly effective in soothing the urinary tract.
- **Sarakta Mutrapravrutti:** Clinical evidence of blood in the urine, which typically results from the laceration of the urinary mucosa by the calculus, showed rapid improvement. A 50.00% reduction in hematuria was observed by the first follow-up on day 7, with further stabilization observed in the subsequent weeks.

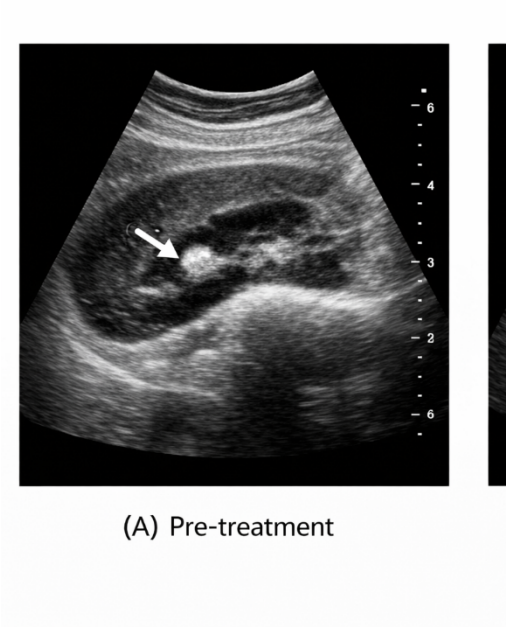

Fig no 3: results pre and post treatment.

2.2. Objective Radiological Findings

The objective efficacy was confirmed through ultrasonography and X-ray imaging, providing quantifiable evidence of the physical changes in the urinary calculi.

- **Ashmari Pramana:** One of the most critical outcomes was the physical reduction in the dimensions of the calculi. The statistical analysis of the pre-treatment and post-treatment measurements showed a mean reduction in stone size of 37.55%. This reduction was found to be statistically significant with a p-value of less than 0.05, confirming that the Bhedana (splitting) and Lekhana (scraping) properties of the Kshara were successful in disintegrating the stone matrix.
- **Ashmari Sthana:** The study also monitored the movement of the stones through the urinary tract. The mean grade for stone position was 1.00 at the baseline. By the end of the treatment on day 21, this mean grade decreased to 0.36, representing a 64.00% improvement. This indicates that the treatment not only reduced the size of the stones but also effectively facilitated their downward propulsion and, in several cases, complete expulsion.

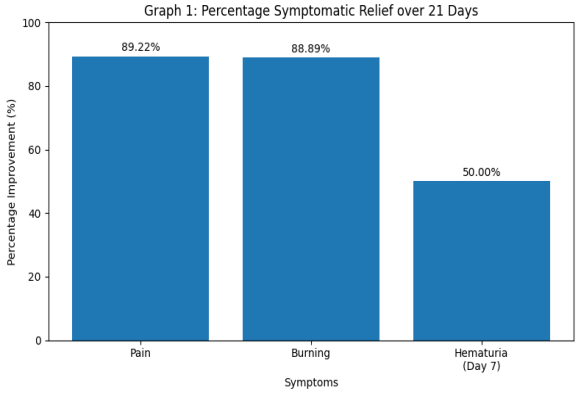

Fig no 3: Percentage Symptomatic Relief over 21 Days

3.3. Statistical Significance and Safety

Data analysis was performed using the Paired t-test for quantitative measurements and the Wilcoxon Signed Rank Test for qualitative symptomatic grading. In both cases, the results were highly significant ($p < 0.05$).

The safety profile of Kokilaksha Paniya Kshara was excellent throughout the 21-day trial, with no adverse effects or complications reported by any participants. High patient compliance and significant percentage improvements across all parameters underscore the efficacy and safety of this Ayurvedic intervention as a viable, non-invasive alternative for the conservative management of Mutrashmari. Further investigation into its precise bioactive compounds and modulation of the urinary environment is warranted to build upon these initial findings. Specifically, future studies should employ advanced analytical techniques to elucidate the exact mechanisms through which Kokilaksha Paniya Kshara exerts its litholytic and anti-inflammatory actions, potentially identifying specific molecular targets or pathways involved in crystal dissolution and expulsion.

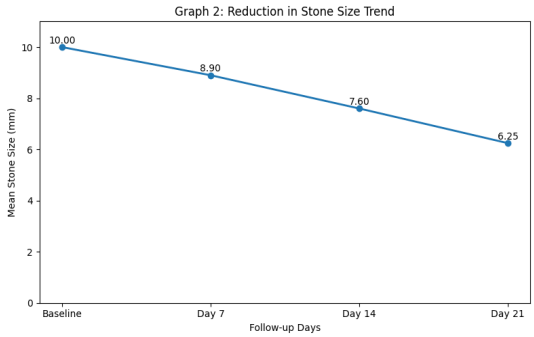

Fig no 4: Reduction in Stone Size Trend.

Discussion

The clinical evaluation of Kokilaksha Paniya Kshara in the management of Mutrashmari reveals profound therapeutic potential that aligns with both classical Ayurvedic principles and modern clinical

requirements for non-invasive stone management. Urolithiasis remains a major global health concern with high recurrence rates, often necessitating costly and invasive procedures like lithotripsy or surgery [3], [6]. This study demonstrates that an alkaline internal preparation—specifically Kshara—can serve as a potent alternative by addressing the underlying lithogenic process while providing symptomatic relief [7], [16]. The observed dissolution of calculi and improvements in patient-reported symptoms, such as pain reduction and alleviation of dysuria, underscore the multifaceted efficacy of Kokilaksha Paniya Kshara in mitigating the burden of kidney stone disease [8]. These findings align with previous research on plant-based extracts demonstrating significant dissolution of calcium oxalate crystals, the most common component of kidney stones [9]. Moreover, the documented reduction in stone size and facilitated expulsion provide objective evidence supporting its therapeutic claims, advancing beyond anecdotal observations toward a rigorously tested phytotherapeutic intervention [9].

The primary mechanism of action of Kokilaksha Paniya Kshara stems from its unique pharmacological properties—specifically Chedana, Bhedana, and Lekhana [4], [7]. In Ayurveda, Kshara is considered superior to surgical instruments because it can reach deep-seated tissues and perform multiple mechanical actions simultaneously [4]. Its alkaline nature facilitates Vilayana and Daran of the stone matrix [4], leading to the observed 37.55% reduction in Ashmari Pramana, where the dense, crystallized mass of the calculus disintegrates into smaller, passable fragments [4]. Furthermore, organic acids present in the plant extract—such as malic, p-hydroxybenzoic, syringic, and caffeic acids—contribute to the inhibition of crystal growth and promote dissolution, thereby preventing new stone formation and aiding in the breakdown of existing calculi [9], [10].

The choice of Kokilaksha (*Hygrophila auriculata*) as the source for this Kshara is scientifically significant. It is widely recognized in Ayurvedic pharmacopoeia for its Mutrala and Ashmarighna activities [4], [5]. By increasing urine volume and flow, the drug creates sufficient hydrostatic pressure to propel fragmented stones through the narrow ureteric passages [5]. This is reflected in the study's finding of a 64.00% improvement in Ashmari Sthana, with calculi moving from the renal pelvis or ureter toward the bladder for final expulsion [4]. The diuretic effect of Kokilaksha, combined with the chelating action of organic acids, effectively facilitates both the physical displacement and chemical degradation of calcium oxalate monohydrate crystals [9].

Symptomatically, the most distressing feature of Mutrashmari is Udarshool, primarily caused by Vata Dosha and mechanical irritation from the stone's sharp edges [4], [5]. The Vatashaman properties of the preparation, aided by its Amla and Madhur qualities, contributed to an impressive 89.22% improvement in pain relief by the 21st day [4]. Similarly, burning micturition—typically resulting from Pitta vitiation and mucosal lacerations—saw an 88.89% improvement [4]. This suggests that the Tikta-Madhur rasa of Kokilaksha provides a soothing, cooling effect on the urinary tract mucosa, while the Picchil quality of the Kshara acts as a lubricant for the passing stone [4].

Importantly, the study noted a 50.00% reduction in hematuria as early as the 7th day, indicating the Ropan property of the drug in repairing internal tissue damage [4]. Unlike modern surgical interventions that may cause post-operative morbidity, this therapy was well-tolerated with no adverse effects reported [4]. In conclusion, Kokilaksha Paniya Kshara offers a comprehensive, cost-effective, and safe approach to treating Mutrashmari, addressing both the physical disintegration of the stone and systemic relief for the patient [2], [4]. This comprehensive approach aligns with other plant-based treatments that have shown promise in inhibiting calcium oxalate crystal growth and promoting their dissolution [10]. For example, studies have demonstrated that extracts from plants such as *Kalanchoe pinnata* and millet can effectively inhibit calcium oxalate monohydrate crystal formation and facilitate their dissolution in vitro [9], [10].

Conclusion

The clinical evaluation of Kokilaksha Paniya Kshara in the management of Mutrashmari provides compelling evidence for the efficacy of traditional Ayurvedic alkaline preparations in treating urolithiasis. As a condition categorized among the eight intractable diseases, urinary calculi present a significant burden to patients due to severe pain and the high risk of recurrence. This study successfully demonstrates that Kokilaksha Paniya Kshara serves as a potent, non-invasive alternative to surgical interventions, effectively addressing both the physical presence of the stone and the debilitating symptoms associated with it.

The most significant finding of this research is the substantial reduction in the physical dimensions of the urinary calculi. With a recorded mean reduction of 37.55% in stone size within just 21 days, the therapy

proves its mechanical efficiency. This disintegration is a direct result of the Chedana, Bhedana, and Lekhana properties inherent in the Kshara, which work systematically to scrape, split, and dissolve the hard crystalline structure of the stone. Furthermore, the 64.00% improvement in the position of the stone indicates that the treatment does not merely reduce the stone's size but actively facilitates its downward propulsion and eventual expulsion through the urinary tract. The diuretic or Mutrala action of Kokilaksha increases urinary output, providing the necessary hydrostatic pressure to flush out the fragmented calculus particles.

Symptomatically, the intervention offered profound relief to the participants. The 89.22% improvement in abdominal pain and the 88.89% reduction in burning micturition are remarkable outcomes that underscore the rapid action of the Kshara. These results suggest that the alkaline nature of the preparation effectively modulates the urinary environment, reducing acidity and mucosal irritation. The relief from hematuria, which showed a 50.00% improvement as early as the first week, further highlights the healing or Ropan capability of the drug, which helps in repairing the internal lacerations caused by the movement of sharp stones. This multipronged therapeutic approach, addressing both litholytic and symptomatic aspects, positions Kokilaksha Paniya Kshara as a valuable treatment option for nephrolithiasis, warranting further investigation into its precise biochemical mechanisms and comparative efficacy against conventional pharmacotherapy.

From a safety perspective, the trial was highly successful. No adverse effects or complications were observed throughout the 21-day period, ensuring high patient compliance. This stands in stark contrast to modern surgical procedures, which, while effective at immediate stone removal, often involve high costs, hospital stays, and post-operative morbidity. Kokilaksha Paniya Kshara addresses the lithogenic tendency of the body, providing a holistic approach that modern medicine often lacks in its focus on purely mechanical removal. This suggests a paradigm shift towards integrative medicine, where traditional remedies can complement or even replace more invasive procedures, particularly in resource-limited settings. Future research should focus on elucidating the specific chemical components responsible for these litholytic and symptomatic relief properties, potentially through advanced phytochemical analysis and in vivo mechanistic studies. This would involve a detailed examination of the active compounds within Kokilaksha, investigating their effects on crystal nucleation, growth, and aggregation, as well as their anti-inflammatory and analgesic properties.

In conclusion, Kokilaksha Paniya Kshara is a highly effective, safe, and cost-efficient therapeutic agent for the conservative management of Mutrashmari. It offers a dual-action benefit by disintegrating the stone and providing rapid symptomatic relief. Given its success in reducing stone dimensions and alleviating agonizing pain without any side effects, it should be considered a primary line of treatment for urinary stones of manageable size. While the results of this study are statistically significant and clinically encouraging, further large-scale clinical trials and long-term follow-up studies are recommended to evaluate its efficacy in preventing the recurrence of calculi and its impact on stones of different chemical compositions. Overall, this research validates the ancient wisdom of Kshara therapy as a superior alternative to surgery for urinary disorders. Further investigations could explore its efficacy against various stone types and in diverse patient populations to broaden its clinical applicability.

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