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A BRIEF REVIEW ON ANTIUROLITHIATIC POTENTIAL OF TRADITIONALLY USED MEDICINAL PLANTS FROM UTTARAKHAND HIMALAYAS

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ABSTRACT: Urolithiasis, commonly known as kidney stone disease, is a prevalent and painful condition resulting from the formation of calculi in the urinary system. This review aims to elucidate the antiurolithiatic properties of medicinal plants, focusing on urolithiasis and stone formation mechanisms. The ethnopharmacological approaches to managing kidney stones highlight the historical and cultural significance of using medicinal plants. Focusing on the ethnobotanical practices in Uttarakhand, it provides a comprehensive list of plants traditionally employed for kidney stone treatment. Specific emphasis is given to the medicinal plants of prime importance, detailing their phytochemical properties and therapeutic efficacy. Furthermore, it reviews global studies on kidney stone treatment, emphasizing pharmacological research and clinical evidence supporting the use of these plants. The interrelation between urolithiasis and non-communicable diseases, such as heart disease, is explored to underline the broader health implications.

INTRODUCTION: Urinary stone disease (urolithiasis) is a chronic, recurrent metabolic disease characterized by the presence of stones in the urinary system, primarily in the kidney, bladder, and urinary tract. Occasionally, urolithiasis and nephrolithiasis are regarded as the same terms, but nephrolithiasis can be called only the stones in the kidney, not in the other parts of the urinary system [1]. The primary cause of urolithiasis is a metabolic disorder that results in the formation of insoluble salts, leading to the formation of stones. The number of stones and their accession can be most of the time, different.

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Factors such as climate, poor water or diet, medication, urinary system abnormalities, hyperparathyroidism, vitamin A and D deficiency, chronic inflammatory diseases, and genetic factors can contribute to the development of urolithiasis. Kidney stones in urolithiasis provide insight into the numerous categories that specialists assign to each one based on its composition and cause of formation. Up to 70% of all occurrences of these stones are calcium-based, primarily composed of calcium phosphate or calcium oxalate.

A number of conditions, such as having a diet high in oxalate-rich foods, hypercalcinuria, and certain metabolic disorders, can cause these stones to form. Uric acid stones can arise when urine has high levels of uric acid, which is likely related to dehydration, certain disorders like gout, and dietary factors. The proportion of uric acid stones is about 12%. Because of the urease-producing bacteria involved, 42% of the stones in these circumstances

may get contaminated, which is linked to persistent UTIs [2]. The first one concerns ammonia production, while the second one is related to urine alkalinization, which raises the chance of stone formation beforehand. Finally, of all the stones documented, cystine stones are the rarest; they account for only 2-3% of all cases. These stones are pathognomonic for a genetic disorder known as cystinuria, which is caused by the improper uptake of cystine from urine leading to its accumulation. For each type of stone, a special diagnostics and treatment regimen that is based on its structural and compositional peculiarities should be developed. This task will perfectly demonstrate the central role of exact identification in having efficient urolithiasis management.

Epidemiology and Prevalence of Kidney Stones: The study of disease and population health in relation to disease incidence in a population is known as epidemiology. The investigation of the health status and newly emerging diseases of specific populations, leading to the generation of critical information for efficient disease control and preventative strategies [3]. Globally, the prevalence of urolithiasis, or kidney stone disease, is declining, and regional epidemiologies are evolving in unique ways. The costs of treating urolithiasis vary from place to place in part because of factors including the increasing incidence of obesity, dietary habits, climate change, and other health problems that raise expenditures.

Approximately 0.5% of the population of Americas and Europe is affected by nephrolithiasis or kidney stone annually. Similar increases in the number of affected individuals have been observed in the USA during the past 20 years, from 3.2% to 5% [2]. In developed countries, the lifetime risk for persons who ever develop kidney stones is about 10 -15%. However, beyond North America and Europe, the risk decreases even more to 10%. Furthermore, in many regions, such as the Middle East, the risk level is simultaneously between 20-25%. The primary cause of nephrolithiasis development is its propensity to recur. According to reports, 50% of patients experience a recurrence of the disease after intervals of 5 to 10 years, and the high figure of 75% within 20 years [4]. There is a pronounced regional variation in the occurrence of kidney stones, with some higher-incidence areas being referred to as "stone belts" due to their greater prevalence rates. This is a process mostly driven by environmental and inherited genetic factors. For instance, kidney stones are more common in those who absorb a lot of sun radiation from hot climates. Therefore, the intense heat and prolonged sun exposure could lead to dehydration. This is one of the things that raises the content of urine and encourages the development of stones. Additionally, the main epidemiological characteristics of kidney stone disease are regional variations, which are largely influenced by diets, water quality, and genetic predisposition. Rising prevalence and recurrence rates of nephrolithiasis are a troublesome issue that further compounds the burden of the condition. The need to create specialised preventative measures and treatment plans for unique environmental and genetic variables present in the various locales, however, makes this barrier even more formidable. It is important to fully understand these characteristics since this will serve as the foundation for any appropriate actions designed to significantly reduce the incidence of kidney stones worldwide.

Pathophysiology and Mechanism of Kidney Stone Formation: In people with kidney stones, their causal mechanism involves a complicated interplay of genetics, metabolism, and environment that ultimately results in solid crystalline formation within the urine tract. It starts with uric supersaturation with calcium, oxalate, uric acid, cystine, and phosphate which are the main forming substances of stones. These particular substances start saturated in the urine, but past their limits, they suddenly precipitate out of the urine and form crystals [5].

Such development results from the overabundance of phosphorous or acid-producing salts in urine, which exceeds their dissolvable threshold. As demonstrated by Flavia Tamborino, this ultimately leads to the nucleation process, in which the ions combine to form tiny clusters or crystalline structures. One becomes calcium-saturated due to factors like poor urine volume, eating too many minerals that can cause stones, and having specific metabolic conditions. When larger ions begin to connect to smaller ones following nucleation, as the urine becomes more concentrated, little urinary crystals may form.

These crystals combine with one another to create larger particles. The existence of inhibitors or activators in the urine, including limited citrate (an inhibitor) and osteopontin (an activator), plays a huge role in the mechanism. These crystals get scattered within the renal tubules but remain tiny and only clinically relevant when they get stuck in a tubule [6]. Considering that infection, tubular cell lesions, poorer stream flow and specific anatomical features may all contribute to crystal retention. The crystals adhering to the renal epithelial cells are crucial to the process of stone formation which is aided by factors such as Randall' plaques (calcium phosphate deposits on the renal papillae) or even the proteins in the cellular matrix. Developing and growing kidney stones may cause a blockage in the urinary tract thus, the patient can have excruciating pain (renal colic) and bacterial infections. Kidney stones that are not treated can lead to the development of more serious complications such as hydronephrosis (swelling of the renal region which is the primary cause of urinary output dysfunction) and progressive chronic kidney disease.

Ethnopharmacological Approaches for the Management of Kidney Stones: The primary objective is to investigate how modern healthcare procedures might benefit from the application of traditional knowledge and techniques.

Historical treatment of renal stones has been rooted in the utilization of natural remedies such as medicinal plants and herbs in various cultures. People primarily use natural remedies derived from their ancestors' experiences and knowledge of their healing effects, based on empirical observation and traditional healing methods. Many plants and herbs have been recognized to be able to be used as both means of prevention and treatment for kidney stones. As an example, the *Phyllanthus niruri* (also called Stone Breaker or Chanca Piedra) belong to the family of South American and Ayurvedic medicine is commonly used due to its supposed feature of dissolving and eliminating urine stones. In the same way, the plants *Aerva lanata* (also referred locally as "Pashan Bheda") and *Saxifraga ligulata* (also known as "patharphori") are used in the traditional Indian medicine for their diuretic and litholytic properties [7]. The cultural beliefs, as well as the practices of using traditional plants and herbs for the kidney stones treatment, is mainly the cause of such a healing. These remedies are perceived as integrative approaches that are aimed not only at curing the physical symptoms but also at taking into account the spiritual and emotional facets of the patient's health. Furthermore, these natural medicines are inexpensive and easy to obtain, which makes them especially beneficial in places with little resources.

Cultural norm and behavioral context of kidney stone management differs depending of different cultures. The spirits or supernatural causes are regarded as the might to draw kidney stones in some cultures, and the treatments may relate to rituals or ceremonies to make the spirits pleased. They believe that eating and living habits have the potential to prevent kidney stones, and hence they will taboo certain foods which rather stop stone formation. For a long time now, the use of traditional medicinal plants and herbs in kidney stones has well found to be effective. Scientific research, however, has continued giving more evidence of their efficacy. Several studies have indicated that substances derived from these particular plants and herbs have a lineage of reducing stone formations, dissolving formed stones, and soothing the symptoms of stone passes as well. The scientific disclosure has aroused interest in national medicine to be integrated into healthcare practice, indicating the possibility of ethnopharmacology in strengthening the health objective internationally [8]. Ethnopharmacological methods of treatment are not only an interesting line of research on traditional healing but may serve as the basis for the implementation of new treatments. By way of linking traditional thinking with current science, such methods that will exacerbate the situation containing these ailments seem the most probable.

Ethnobotanical Approaches for the Management of Kidney Stones in Uttarakhand: The kidney stones, or nephrolithiasis, are considered as very widespread renal system disorder, having its course in the formation of solid crystals in the urine ducts. Uttarakhand, a Northern Indian state known for its diverse plant and animal forms, is now facing a broader concern of kidney sand. The mountains and long yielding temperature of Uttarakhand point to a dehydrated condition and therefore, the major cause of kidney stones.

The prevalence levels of kidney stones in Uttarakhand [9], is claimed to be approximately 10%. As such, 8% of city dwellers experience vulnerability of a higher magnitude, especially in the hilly areas in contrast to the plains. In Uttarakhand, traditional plants and herbs have been used for decades to treat kidney stones **Fig. 1**.

Ethnopharmacology, a medical field that has received a lot of attention recently, has found its place in this practice. The region's botanical diversity has led to the identification of a few plants that have both a diuretic and a stone-dissolving property.

According to a different study, the plant known locally as "Apamarga" or *Achyranthes aspera* in Uttarakhand is renowned for its diuretic and anti-inflammatory properties in the region being studied. Another plant known as *Bergenia ciliata* (burst translation by Pashanbhed) is used in traditional Ayurvedic medicine to treat kidney stones due to its luteolytic properties. These plants are produced as infusions or decoctions after being finely chopped. After that, the infusions or decoctions are taken orally to reduce symptoms and facilitate the passage of stones.

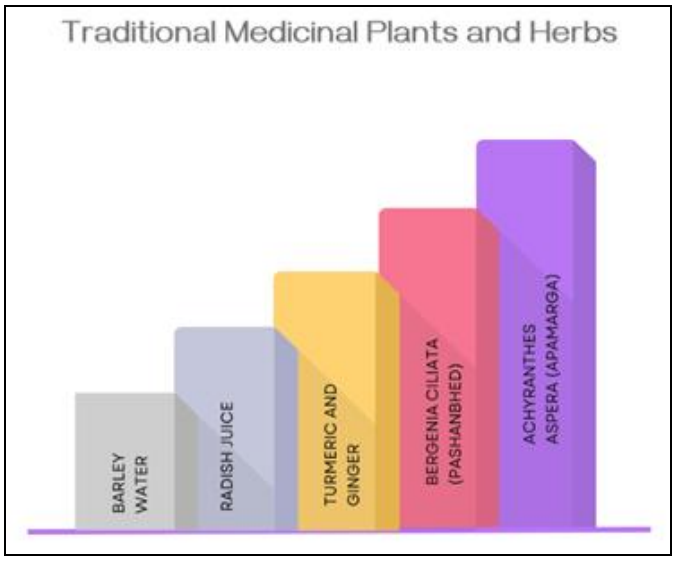

FIG. 1: NAMES OF SOME TRADITIONAL MEDICINAL PLANTS AND HERBS

Indigenous knowledge of Uttarakhand tribes is a scientific treasure trove not only for stone management but also a complete health care. This knowledge is transmitted through oral traditions from generation to generation. Their practices can effortlessly involve dietary advice, lifestyle changes, and particular rituals or ceremonies that are considered beneficial for health reasons.

On the other hand, certain nutrition techniques like radiation juice and barley water for kidney stone dissolving and blocking reappearance are highly believed [10]. Furthermore, herbs and spices specific to the cooking process such as turmeric and ginger being used have a significant role in promoting kidney health and preventing stone formation.

The Traditional medicinal approaches for stone removal of kidney to Pahadi district greatly affect the present public health practices. Bringing traditional methodology and native culture into the current healthcare system could improve the efficiency of intervention and measuring modules. Some of the exercises require caution because we may face risks like positional vertigo or injuries. Also, good research into the efficacy and safety of the native plants and herbs used in Uttarakhand can empower their use and encourage evidence-based healthcare practice development.

The ethnopharmacological mechanisms of the management of kidney stones in Uttarakhand indicate qualifiable traditional knowledge and practices in therapeutics. Together with contemporary research, indigenous scientific knowledge can be leveraged to create holistic, culturally sensitive methods of kidney stone management that will be far more effective for the local population and lead to improvements in health **Table 1.**

FIG. 2:

TABLE 1: A LIST OF MEDICINAL PLANT USED FOR KIDNEY DISEASE

S. no.	Local Name	Botanical Name	Family	Part Use	Ethno-medicinal uses
1	Gahat	*Macrotyloma uniflorum (Lam.) Verdc.*	Fabaceae	Seed	Kidney stones, urinary dieases.
2	Chirchita	*Achyranthes aspera L.*	Amaranthaceae	Whole plant	Diuretic, antispasmodic, laxative and stomachic.
3.	Saireya	*Barleriastrigosa (Willd.)*	Acanthaceae	Whole plant	Urinary disorders.
4.	Kaamle	*Boehmeria platyphylla Buch.-Ham. ex D.Don*	Urticaceae	Leaves	Urinary problems.
5.	Chakundra	*Cassia occidentalis L.*	Fabaceae	Whole plant	Diuretic, stomachic.
6.	Kardra	*Cirsium arvense (L.) Scop*	Asteraceae	Roots	Diuretic.
7.	Chirpat	*Desmodiumg angeticum (L.) DC*	Fabaceae	Roots	For gall bladder stones and kidney stones.
8.	Pithpapra	*Drymaria cordata (L.) Willd. Ex R. & S.*	Caryophyllaceae	Whole plant	Diuretic, stomachic.
9.	Bubani	*Fimbristylis bisumbellata(Forsk.) Bubani*	Cyperaceae	Rhizomes	kidney problems.
10.	Chansar	*Lepidium virginicum L.*	Brassicaceae	Seeds	Diuretic.
11.	Shahtut	*Morus nigra L.*	Moraceae	Bark	Diuretic.
12.	Kharenti	*Sida cordifolia L.*	Malvaceae	Whole plant	Diuretic.
13.	Denusha	*Sida cordifolia L.*	Malvaceae	Stem bark, Root	Infusion of root is beneficial in urinary disorders.
14.	Chamlai	*Desmodium elegans DC.*	Fabaceae	Root	Root decoction is given in urinary disorders.
15.	Silphora	*Bergenia ligulata Engl.*	Saxifragaceae	Rhizome	Decoction of rhizome is given orally to cure kidney stone.
16.	Siplphra.	*Bergenia stracheyi (Hk.f. & Th.) Engl.*	Saxifragaceae	Rhizome	Fresh rhizome are removed and washed thoroughly, cut in to pieces and chewed like candy to cure urinary and kidney stone.
17.	Kurz	*Woodfordia fruiticosa (L.) Kurz.*	Lythraceae	Root, Flower	Infusion of flowers is given to cure urinary disorders.
18.	Kantela	*Echinops cornigerus DC.*	Asteraceae	Root	Root juice is taken in urinary disorders and fever.
19	Daiya	*Callicarpa macrophylla Vahl.*	Verbenaceae	Seed, leaf, fruit	Fruits are eaten in urinary disorders.
20.	Ban Tulsi	*Origanum vulgare L.*	Lamiaceae	Whole plant	Decoction of whole plant is given orally in urinary disorders
21.	Punarnava	*Boerhaavia diffusa L.*	Nyctaginaceae	Root	Root juice is administered orally in asthma and urinary disorder.
22.	Jangli Palak	*Rumex nepalensis Spr.*	Polygonaceae	Leaf	Leaf paste is applied on cuts, wounds, insect sting, urinary disorder.
23.	Amla	*Emblica officinalis Gaertn.*	Euphorbiaceae	Fruit	Fruit juice is given to increase the flow of urine, act as diuretic.
24.	Silphodi.	*Bergenia ciliata (Haw.) Sternb.*	Saxifragaceae	Root	Kidney stone.
25.	Jamun	*Syzygium cumini L.*	Myrtaceae	Fruit	Ripe fruits are used in kidney stone.
26.	Banfsha	*Viola pilosa Blume*	Violaceae	Flower	Flowers are used to treat kidney diseases.
27.	Jangali bhindi	*Abelmoschus moschatus Medik.*	Malvaceae	Root, Seed	Diuretic, stomachic.
28.	Satawarikairua, Katerwali vel	*Asparagus racemosus Willd.*	Asparagaceae	Root, Rhizome	Stomachache, urinary disorders.
29.	Sirparha	*Bergenia ciliata (Haw.) Sternb.*	Saxifragaceae	Root	Root powder is very useful in kidney stones.

30.	Daya,	*Callicarpa macrophylla Vahl.*	Lamiaceae	Fruit	Very helpful in urinary disorders.
31	Bhotiabadam	*Corylus colurna L.*	Betulaceae	Nut	Direct use of nut or its tonic use as diuretic.
32.	Soriul	*Dicliptera bupleuroides Nees*	Acanthaceae	Seed, Leaf	Decoction of seeds and leaves with water very useful in urinary tract infections.
33.	Kusum	*Euonymus tingens Wall.*	Celastraceae	Whole plant	The powder mixture of 10gm with opium seeds (10gm), almond (5gm), kali mirch (5gm) and banshmishri (10gm) used orally in kidney stone.
34.	Timul, Timil	*Ficus auriculata Lour.*	Moraceae	Whole plant	The extract inhibits insulinase activity from liver and kidney.
35.	Talmakhana	*Hygrophila auriculata (Schumach.) Heine*	Acanthaceae	Seed	whole plant extract used in treatment of urinary infection and as a diuretic.
36.	Chimi	*Lablab purpureus (L.) Sweet*	Fabaceae	Whole plant	Antioxidant, antilithiatic, antispasmodic.
37.	Kakoli	*Lilium polyphyllumD.Don*	Liliaceae	Root	Tonic and decoction of root used as diuretic.
38.	Dekrain	*Melia azedarach L.*	Meliaceae	Root	Antilithic, diuretic.
39.	Dog Rose	*Rosa canina L.*	Rosaceae	Leaf, Fruit	The fruits have been used internally as tea for treatment of disorders of the kidneys and urinary tract.
40.	Bara Mamas	*Urena lobata L.*	Malvaceae	Whole plant	Tonic and paste of whole plant is administered orally with milk to control urinary problems.
41.	Babul	*Vachellia nilotica (L.) P.J.H.Hurter& Mabb.*	Fabaceae	Whole plant	Diuretic.
42.	Urad dal	*Vigna mungo (L.) Hepper*	Fabaceae	Fruit	urinary tract infections.
43.	Jungle Angoor	*Vitis vulpina L.*	Vitaceae	Leaf, Fruit	Kidney diseases.
44.	Ajubi/Sprout Leaf plant	*Kalanchoe pinnate (Lam) Pers.*	Crassulaceae	Leaf	40-50 ml. leaf extract of this plant two times in a day used in treatment of renal calculi and infection in urinary bladder.
45.	Kakree	*Cucumis sativus*	Cucurbitaceae	Seed	Urinary disorder.
46.	Elaroo	*Cucumis hardwickii*	Cucurbitaceae	Root, Seed	Fever, Urination.
47.	Kala bhatt	*Glycine max*	Fabaceae	Seed	Kidney stone.
48.	Tagar	*Valeriana hardwickii*	Valerianaceae	Root	Urinary disorder.
49.	Pashanbheda	*Berginialigulata*	Saxifragaceae	Seed, root	Remove renal stones.
50.	Dhaniya	*Coriandrum sativum L. H*	Apiaceae	Whole plant	Infusion of whole plant and decoction of seed used as diuretic and other urinary problems.
51.	Ghigharo	*Pyracantha crenulata (D. Don) M. Roemer*	Rosaceae	Fruit	Powder of dry fruit is litholytic in property and used to cure calculi.
52.	Shishuna	*Urtica dioica L.*	Urticaceae	Leaf	Vegetable of leaves in used as diuretic. Infusion prepared from leaves is used to cure calculi.
53.	Makoi	*Solanum nigrum L*	Solanaceae	Leaf	Decoction of leaves is used as diuretic. Paste of leaves in very small quantity with luke water is used to treat calculi generally uric acid stone.
54.	Pippali	*Piper longum L.*	Piperaceae	Fruit	Powder of fruits is is used in renal calculi.
55.	Chilmora, Salmosi	*Oxalis corniculata L.*	Polygonaceae	Leaf	Decoction of leaves used to due to cure urinary troblus.

The Medicinal Plants of Prime Importance for the Treatment of Kidney Stone: A significant therapeutic strategy that has been commonly used globally is the management of kidney stones, a problem for which many cultures use medicinal plants as a remedy. These plants, which medically

provide the body with a great deal of relaxation and ease, have significantly reduced pain and made room for kidney stones to pass. In this section of the paper, we touch upon the key medicinal plants having a significant role in the mainstream treatment of kidney stones distressing our readers to traditional uses, the chemistry behind the plants, and the concepts of action as discussed by Aslam Khan in her review article [11].

Barberry (*Berberis vulgaris*): Barberry (*Berberis vulgaris*), a genus of the Berberidaceae family, is the original member of the traditional medicine for health in two great ancient countries, Iran and China, having over three thousand years of history. The fruit of the amla plant contains a variety of biologically active substances, including vitamin C, 30 identified alkaloids, phenolic compounds, *etc*. In addition, berberine's antioxidant, nephrolithicity, and anti-inflammatory properties are noteworthy. Berberine's therapeutic actions, which include diuretic, hypocalciuric, antioxidant, and urine alkalinizing properties, help treat kidney stones. By acting as a diuretic and raising urine volume and pH while lowering urine's calcium concentration, it lowers the risk of stone formation by causing urine to become supersaturated. Berberine, despite all of its advantages, has absolute side effects that include rashes, constipation, and indigestion

Black Seed (*Nigella sativa*): Bazeh (*Nigella sativa)*, which belongs to the Ranunculaceae family, consists of some main components such as alkaloids, saponin proteins, fatty oil, and essential oil, of which thymoquinone is the most important nutrient of this product. Thymoquinone is currently researched in the treatment of nephrolithiasis and has also revealed various pharmacological actions. It is proven that *N. sativa* can diminish the number of CaOx stones and also has the effect of a strong antidepressant by neutralizing similar species of superoxide anions and free radicals that are deposited in the epithelial tissue in the kidney. Thymoquinone is also found to block the cyclooxygenase and 5-lipoxygenase routes which then, in turn, lead to inhibition of inflammation. Black seed is usually considered safe in food when pregnant, but large medicinal doses may be dangerous in that they can decline contraction of the mother's uterus; slow blood clotting and reduce blood sugar and blood pressure levels.

Celery (*Apium graveolens*): Celery (Apium graveolens), which belongs to the Apiaceous family of herbs, is a first-rate example of flavonoids, among which apigenin is the main essential flavonoid that is responsible for the dissolving of calcium crystals. We conducted an *in-vivo* experiment on rabbits that were induced with nephrocalcinosis, showing *A. graveolens* to have significantly lower BUN, serum creatinine, and sodium levels as well as reduced calcium build-up in renal parenchyma. This obstructive effect can be explained by the diuresis induced by its properties. As well as its advantages, it is likely that pregnant mothers should avoid using celery oil and seeds due to them being hazardous during pregnancy and they can cause uterine contractions leading to miscarriage. However, the study does not provide adequate information about the safety during lactation and it is also likely that the selected doses are probably elevating the risk of breathing. The celery should stay off the table as it may be dangerous for the kidneys and may cause a lowering of your blood pressure.

Manjistha (*Rubia cordifolia*): Djangmitya (*Rubia cordifolia*), called by other names like common madder, or Indian madder, possesses the richness of flowers from the Rubiaceae family. The roots of *Rubia cordifolia* are used to have medicinal properties that are tonic, antidysentery, astringent, and antiseptic. Manjistha roots, which are the best in avoiding the formation of kidney stones, accomplish this due to the reduction of calcium and oxalate levels in the kidneys which could result in the stone's growth in the urinary tract. *In-vitro*, the hydro-alcoholic extract of the *Rubia cordifolia* root (HARC) was demonstrated to be dose-dependently capable of decreasing the excretion of oxalic acid, phosphate, and calcium in the urine, which led to the potential of protection against the lithogenic induced by ethylene glycol. The compound's nephroprotective and antioxidant properties demonstrate the aforementioned preventative effects. If using HARC to avoid renal stones is appropriate, it must be used correctly; pregnant and nursing women should not use HARC due to safety concerns.

Olive (*Olea europaea*): The olive-bearing tree (*Olea europaea*) of the Oleaceae family is a pervasive species mostly found across

Mediterranean regions. Different plant parts are also used in traditional medicine, with the leaves and fruits being the main ones used to treat urinary tract infections and increase the level of urination, for which extracts are used to address gallstones, diabetes, hair loss, heart problems, and other diseases. Olive oil exhibits antilithiasis activity which is mediated through flavonoid compounds present in it and thus, inhibits oxidative stress and urinary crystal formation caused by hyperoxaluria. With this in mind, the supplement compound may also help in reducing the process by inhibiting carbonic anhydrase and improving glomerular filtration. Olive leaf alcohol extract together with vitamin C can be combined to cut back serum calcium that can be used to prevent the formation and dissolution of stones. However, patients who often take these drugs experience gastrointestinal discomfort, headaches, nausea, and vertigo. Some might well suffocate from the pollen of olive or their reasons could be smoke extracts. It is essential to stop olive oil consumption at least two weeks before the surgery date because of the influence it may have on blood sugar control.

In a few words, these above plants belonging to the herbaceous families proved sufficient to produce a few of the many effective medicinal plants used against kidney stones. These plants are making innovations in the sphere of stone formation reduction and have strong potential to be used as supportive full-featured treatment courses for the kidneys. Nevertheless, among the adverse reactions and interactions with other drugs, the patients should be prepared. The reasons for their effects and clinical trials still need further testing, so that their mechanism and therapeutic usage will be better understood.

Pharmacological Studies of Urolithiasis: There have been several pharmacological research using medicinal plants and their constituents to prevent and treat kidney stones. One such study involves inhibiting chemicals that produce stones, or rather, boosting those that prevent them, such as potassium and magnesium. The possibility that a variety of pharmacologic drugs could be utilised to prevent or treat kidney stones has been highlighted by the experimental evidence. It has also been demonstrated how they approach the issue. *Phyllanthus niruri*, also known as Chanca Piedra, is the plant that has been the subject of the most extensive research. According to studies like the one done by Ayesha Jamshed, this species increases urine output, lowers calcium levels, and inhibits the formation of calcium oxalate crystals. The combined effect of these acts is antiolithiatic. Furthermore, *Aerva lanata's* active ingredients have the ability to function as litholytics and diuretics, reducing kidney stone inflammation and facilitating urine outflow, all of which may be beneficial in the management of kidney stones [12]. According to research, the herb Saxifraligulata, also referred to as the common yellow-blooming rock plant, has the ability to prevent the formation of calcium oxalate crystals, which may increase the pH and citrate levels in the urine and reduce the size of stones in the urinary tract.

These pharmacological agents exert their effects through various mechanisms.

Inhibition of Crystal Formation: Most urolithiliatic plants and compounds act via the suppression of crystals in urinary tract formation. They are capable of this by changing the concentration of certain components of urine, which makes urine less likely to crystal formation, or by disrupting the crystallization process directly.

Diuretic Effects: The *Aerva lanata* plant, for instance, can grow stimulatory to the production of more urine. The use of this diuretic leads to small stones flushing out and fresh stones formation prevention, as concentrations of those stones-forming factors in urine decrease.

Anti-inflammatory Effects: Inflammation interacts with the pain and related discomfort from kidney stones. For example, *Phyllanthus niruri* contains nutrients that help avoid inflammation in a way that may stop the symptoms from spiking.

Antioxidant Effects: Oxidative stress is believed to be involved in the outcome of kidney stones' creation. Antioxidant substances like those found in certain plant drugs as well as others can serve as a shield against oxidative damage and therefore prevent the formation of stone.

The chemical pharmacology of medicinal plants and extracts in the effort to cure urolithiasis has opened a window of opportunity for further

investigation of their mechanisms of reactions as well as beneficial effects. These studies show that by natural products the treatment of kidney stones can be managed even in hospitals. Thus, more research has to be done in this case for their use in the clinical fields.

Clinical Evidence and Case Studies: For ages, one of the most prized treatments in conventional medicine has been the use of herbs as a therapy to treat kidney stones, or urolithiasis. As proof of the efficacy of traditional natural medicines has emerged in the field of modern medicine, there has been a growing movement towards more holistic and natural healthcare practices as opposed to conventional medicine. The role of medicinal herbs in kidney stone treatment is highlighted in the part including clinical evidence and a case study. It aims to provide a thorough overview of how these alternative therapies have advanced to the level of modern practice and may have implications for patient care by examining the designs of clinical trials, observational research, and case reports.

Animal and human studies have revealed that *Phaseolus vulgaris* (common bean) drains the fluid from the body and contributes to the main function of kidneys [13]. A trial with sixty patients who have UTI and stones of 10 mm or less was conducted to convert the aqueous extraction of *Phaseolus vulgaris* over six weeks with the result. The study reported an increase in urinary volume and potassium levels which were found to be significantly more among the treatment group compared to the placebo group. Moreover, an opposite trend was observed in the treatment group concerning urinary calcium, oxalate, and uric acid which were found to be significantly less among the treatment group when compared to the placebo group. However, magnesium and an increase in urine to pH level have been only slight and therefore, not significant. Moreover, the patient underwent renal ultrasound after four weeks of treatment, which showed a substantial decrease in stone sizes and numbers, indicating stone breakup and subsequent expulsion from the kidney.

Nigella sativa comprises its native name – black seed – besides the deep historical reference in Middle Eastern traditional medicine. The traditional approach included chewing black seed with water and a few drops of honey to cure kidney stones. Rat metabolism studies revealed that black seeds and black-seed extracts (in suspensions of water and ethanol) lowered the formation of calcium oxalate crystals in rats having hyperoxaluria. In a randomized, double-blind, placebo-controlled trial, 60 patients with kidney stones larger than 5 mm were divided into two groups: for instance, desired individuals were allocated 500 mg of black seed powder capsules twice a day for ten weeks, while the other subjects were given placebos [14]. Finally, the performance analysis showed the following result: 44. 4% of the patients in the treatment group did not show any stone at all, and 57% of them showed a decrease in the stone size to 50% or less. 9 of them indicated that the size of the stones decreased after their treatment. In contrast, only 15. 3% of the placebo group were successful in eliminating the stones, while the rest did not experience any visible change nor did their size composite certain causes.

The celosia argentea with Cock's Comb name is to treat the kidney problem according to Ayurvedic medicine. A small study that showed the efficacy of Sitivaraka seeds of the same size of which is the *Celosia argentea* with potassium citrate was conducted by dividing 44 patients with stones of about 8mm in size into two groups [15]. One group got no other treatment but only Sitivaraka seed preparation thrice older the other received potassium citrate. Six months later the herbal drug group (newly formed) had a remarkable reduction in the stone size and serum parathyroid hormone (PTH). Nevertheless, the urea and sulfates were slightly marginally at six months' time period.

Phyllanthus niruri, a plant distributed widely is used traditionally as tea to treat renal calculi is commonly used in Brazil and Brazil has the highest prevalence of renal calculi. A placebo-controlled and randomized trial with 69 patients involved a lyophilized extract of plant *Phyllanthus niruri* (450 mg) that was taken three times a day. The duration of the treatment was three months. The study highlighted a pronounced decrease in the excretion of calcium nitrogen in the urine of hypercalciuria subjects, however, there were no substantial changes in the remainder of biochemical parameters [16].

Predicating another study of 56 patients with different lithogenic disorders, it has been determined that *Phyllanthus niruri* tea intake twice a daily for 12 weeks will significantly increase the urinary potassium and magnesium levels and reduce the levels of uric acid and oxalate. 67 is traced by the reduction in the number and size of rocks.

Based on a case study Pauri (PAURI Garhwal), Uttarakhand conducted by Arun K Khajuria and NS Bisht, nephrolithiasis, which the kidney disease and occurs because calcium oxalate or phosphate deposition within the kidney, is known to have a global prevalence of 12% [17]. The disease can also result in complications like renal failure and re-establishes the same patients. The use of standard drugs for the prevention of nephrolithiasis is neither enticing nor beneficial because patients may experience adverse responses immediately. Ethnomedical plants have been playing a pivotal role and offering a plausible alternative in traditional healthcare setups, looking to treat nephrolithiasis. Pre-colonial knowledge is sickled on a few number of elders, therefore documenting it is crucial, especially in rural areas. The present research describes 30 herbs effective in the treatment of kidney stones that can be used as a prospect for drug discovery as well as in the identification of novel compounds.

If these herbs are used in a cost-effective and ecologically beneficial way, they can be used as the foundation for unconventional treatments, which will help people become less dependent on expensive, side-effect-prone medications and ensuring that traditional knowledge is preserved for future generations. The study was implemented in the temperate forests of Pauri Garhwal District attempting to call attention to medicinal plants that might be useful as alternative treatments for nephrolithiasis. The field trips were made between the years of 2014-2016 in the Hurricane region of Uttarakhand Garhwali Hill at an altitude of 1750 meters above the mean sea level. The plants were assembled and classified based on their utilization of known labels and the existing literature. Indigenous knowledge was collected using questionnaires from various villages. Households interrogated numbered 30. Accordingly, a total of 30 plants from 24 families were recognized including 5 widely used by local people of the tea growing area, Pauri district for their traditional medicine in nephrolithiasis cases. The course work focused on the collection and recording of ethnomedicinal plants used by local people, thus pointing out the valuable part of traditional knowledge in the treatment of nephrolithiasis and some other urinary problems. The literature review disclosed that traditional plants have been used for ages to cure and prevent diseases from occurring as well as treatment of nephrolithiasis disease which represents evidence of the disparate values and wealth of ethnomedicine in India. It reported 30 Herbo-treatment plants in the Himalayan temperate forest of Pauri Garhwal, of which 15 were mostly natural drugs for nephrolithiasis practice by villagers. The information concerning these medicinal plants is not always shared wider in villages, pointing to the need for documentation and storing this often-priceless knowledge so it could be passed down to future generations.

Future Directions: The urolithiasis field is currently at its take-off stage, signaling an unprecedented wave of valuable discoveries enabled by the implementation of several very prospective directions. Indeed, the interest in the blending of the use of traditional medicine with modern healthcare practices is by the day becoming more common. The studies need to investigate the effectiveness as well as safety of ethnomedicinal plant use in large populations of patients treated in clinical trials. The target-based approach may result in hitherto unseen pharmaceutical products or additional therapies to be used in the management of urolithiasis.

The second area is through the application of advanced technological tools such as machine learning and artificial intelligence (AI) that harbor a lot of great opportunities in urolithiasis research. Such analytical technologies can process thousands or even millions of data, including genetic information, pollution data, and thorough clinical history, and enable to establishment of personalized profiles and results. In addition, AI helps find new compounds that may possess antiurolithiatic attributes and can be efficient urolithiasis treatments. Furthermore, preventive strategies are necessary to reduce the magnitude of urolithiasis. Promoting public health programs directed at

dietary shifts, proper hydration, and implementing exercise and lifestyle modification campaigns will reduce the risk of stone formation. Education and awareness programs based on risk perception among the high-risk group could be much effective.

CONCLUSION: Incidentally, urolithiasis is still a major public health issue not only in developed countries but also in emerging markets with a considerable percentage of the population as the patients. The treatment of kidney stones with the help of herbal medicines which have been used for a long period already not only will give the researcher a better view of the mechanism involved but will also help identify some therapeutic ways. Regions similar to the Kumaun Himalayas have a wealthy biological diversity that offers ethnomedicinal plants that are often used to manage diseases of the urinary system. This points to the fact that indigenous knowledge has to be saved.

Although conventional medicine has a decent future, trials that meet rigorous scientific validation are fundamental to ensure effectiveness and safety. It is necessary for the next phase of research to concentrate on more strictly designed clinical trials, to consider a range of novel treatment modalities, and to incorporate traditional rituals into modern healthcare systems. Utilizing the traditional knowledge of medicine and integrating the modern scientific approaches will assist us in developing better and more comprehensive strategies for the prevention and management of urolithiasis, therefore, the condition can be alleviated to enhance both the quality and life of the affected individuals.

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