**International Journal of Scientific Research in Biological Sciences**
Vol.**11**, Issue.**2**, pp.**32-38**, April **2024**
E-ISSN: 2347-7520
Available online at: www.isroset.org

Review Article

# Kidney Stone Epidemiology, Risk Factors, and Ethno-Medical Approaches: *A Short Communication*

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**Received**: 27/Feb/2024; **Accepted**: 30/Mar/2024; **Published**: 30/Apr/2024

***Abstract***— Stone isK the dominant problem in the world due to number of factors associated with dietary habits affected to the renal, filtration and urinary systems directly and indirectly, which may causes by the deposition of elements in form of oxalate, silicate, phosphate and uric acid. Stone diseases also concerned with some major elements which comprises secondary and tertiary derivatives which partially or completely affected to concern function organs and its metabolism. Increased incidence in males as compared to females subjects were highly acknowledges. It also has been attributed to increased dietary protein intake, which increases and induced the urinary excretion of phosphates, magnesium and reduces urinary citrate status etc. The treatment of stone disease and concerned complicated factor problems resolves by medicated principles allopathically and homeopathically but the most of the prominent treatments allowed by Ayurveda system. Most of the ethno medicinal and herbal therapy not only declines the ratio of concerned elements but also possess a diverse significant protective response which is reviewed here with updated information. In this review article we are focused on the etiology and epidemiology of kidney stone in population of various age groups with respective gender ratio along with role of diet in kidney stone. The study also illustrates the ethno medical approaches with certain ethno herbal plants which are effectively used for the treatment of kidney stone.

***Keywords***— Stone disease, complicated factors, etiology, ethno medicinal treatments.

## 1. Introduction

Around 10% of persons worldwide suffer from kidney stones, commonly referred to as urinary stones or nephrolithiasis, and the frequency of stone illness is rising. Over 80% of kidney stones are calcium-containing calculi, which are the consequence of an imbalance between crystallization promoters and inhibitors [1]. By the age of 70, kidney stone disease affects more than 15% of men and more than 5% of women, posing a significant clinical and financial burden on society. In the UK, it causes about 80,000 hospital episodes annually, and according to data from the US, its prevalence rose from 3.8% in 1976–1980 to 8.8% in 2007–2010.

However, kidney stones are frequently recurrent; after ten years of the initial attack, up to 50% of people experience another episode. Treatment for recurrent stone illness has been associated with a reduction in renal function [2]. Urine is a clear, liquid chemical solution made up of several different compounds that can crystallize inside of tissue and then grow and develop into specific shapes and sizes to create stones. According to science, stones are made up of a mixture of solutes from urine, such as phosphate, uric acid, calcium, and oxalate, which combine to form stones and stone fragments.

According to a recent study, approximately 1 in 17 persons in China are presently afflicted with kidney stones, with a frequency of 5.8% among Chinese adults (6.5% in males and 5.1% in women) [3]. In India, the most common cause of urolithiasis is discovered to be calcium oxalate. Nephrolithiasis has a complex aetiology comprising hereditary and environmental variables in most cases, or most persons. Even so, twin studies indicate that nephrolithiasis and hypercalciuria have heritabilities of over 45% and 50%, respectively, and that the genetic influence on stone formation in these idiopathic stone formers is still significant [4].

A significant portion of the Indian populace experiences kidney and urinary tract stones, which are caused by the accumulation of calcium, phosphate, and oxalates crystals. Stones may linger indefinitely and cause one or more secondary problems that have a major negative impact on the

 

subject or series of problems. It hurts a lot, and a correct remedy is required to solve the issue. A visual representation showcasing obstructing and non-obstructing stones is represented in **fig. 1.** Obstructing stones can lead to severe pain and complications, while non-obstructing stones may remain asymptomatic but still require monitoring and management." [4].

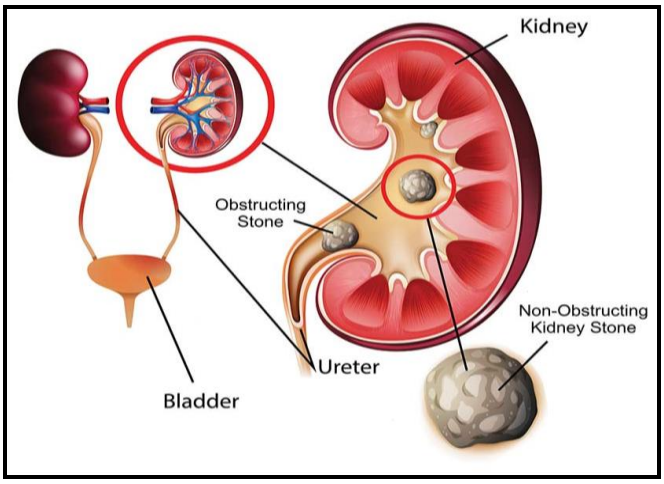


**Figure 1.** Visual representation of obstructing and non-obstructing Kidney Stone.

The review article delves into the worldwide pervasiveness, the study of disease transmission, etiology, dietary elements, and ethno-clinical medicines of kidney stones or nephrolithiasis. It features that kidney stones influence a critical piece of the populace around the world, with calcium-containing calculi being the most widely recognized type. The frequency of kidney stones is on the ascent, presenting both clinical and monetary weights on social orders. Factors like hereditary qualities, ecological factors, diet, and water consumption assume significant parts in stone development.

The article highlights the significance of understanding the age and orientation circulation of kidney stones, noticing that while men are customarily at higher gamble, there has been a prominent ascent in predominance among ladies, especially those under 60. It talks about the job of dietary propensities in stone development, stressing the requirement for customized dietary treatment in light of metabolic assessment. Furthermore, it investigates the etiology of kidney stones, including metabolic issues and different kinds of stones.

Moreover, the study looks at ethno-clinical methodologies and home grown medicines for kidney stones, featuring the utilization of restorative plants in conventional medication. It examines studies exhibiting the viability of specific plant extricates in hindering stone arrangement and advancing the disintegration of stones.

## 2. Epidemiology of Nephrolithiasis (Kidney Stone)

Nephrolithiasis is a widely observed condition globally, with prevalence rates varying from 7 to 13% in North America, 5–9% in Europe, and 1–5% in Asia. The management of stones is costly due to the significant occurrence of both new and recurring cases, leading to considerable acute and chronic health issues [5]. It is undisputed that stone and worry issues influence the entire world. The Nordic region, the Mediterranean region, the British Isles, northern Australia, and Central Europe are kidney stone country. whereas the incidence of kidney stone development is lower in regions like Central and South America, some parts of Africa, and the Malayan Peninsula, China, Pakistan, and northern India.

Asia's stone-forming belt is said to cross the following countries: Pakistan, India, Burma, Thailand, Indonesia, Philippines, Saudi Arabia, the United Arab Emirates, and the Islamic Republic of Iran [6]. The physical temperature of the atmosphere, which is high and increases sweating, may have a direct impact on the established geography for stone formation incidence. This might lead to concentrated urine, which would then encourage higher urinary crystallization. .

### 2.1 Age Groups And Gender Ratio

The likelihood of developing stones varies globally and is believed to be 1-5% in Asia, 5-9% in Europe, and 13% in North America. The recurrence rate of renal stones is approximately 75% during a 20-year period. Both men and women can experience it, but men are often at higher risk, and young women are experiencing it more frequently [7]. According to estimates, kidney stones affect 12% of men and 5% of women in America [8]. According to earlier research, which involved a representative sample of adult Americans, the estimated yearly cumulative incidence of stone occurrence is getting close to 1%. Additionally, it seems that this incidence is rising with a period of time increased from 0.6% in 2005 to 0.9% in 2015 [9].

Later reports suggested that endogenous estrogen and estrogen treatment in postmenopausal women may reduce the risk of stone recurrence by lowering urinary calcium and calcium oxalate saturation. Initially, the lower risk of stone formation in women was attributed to increased urinary citrate concentrations due to the lower urinary saturation of stone forming salts. Because estrogen raises protective citrate levels and keeps urine alkaline, it may also aid in the prevention of calcium stone formation. Between 2007 and 2018, the estimated prevalence of kidney stones in men in the adult US population remained constant. Concurrently, there was a notable rise in this frequency among females, especially those under 60.

While kidney stones are still more common in males than in women, over the past ten years, there seems to have been a decline in the gender difference in kidney stone prevalence. Disparities in kidney stone disease have been noted between racial groups, weight status, and female reproductive variables. Heavy metals can alter the urinary environment, leading to changes in the concentration of calcium, oxalate,

 

and other minerals. For example, cadmium exposure has been associated with increased urinary excretion of calcium and oxalate, both of which are key components of calcium oxalate stones, the most common type of kidney stone [10]. Age and gender are closely correlated with the composition of stones. During the busiest time of their working lives, men and women experienced the highest incidence of calculi. Calcium oxalate (CaOx), accounting for 71.4% of all primary stone components, was the most prevalent, followed by carbonate apatite (10.2%) and uric acid (UA) (8.3%). Rarely were stones detected as cystine (0.4%), protein (0.5%), brushite (1.3%), and struvite (2.1%). Men were more likely than women to have CaOx (75%) and UA stones (81%), with a p-value of less than 0.001 [11]. In a case-control research, 30 patients with renal stones and 30 controls who visited GTB Hospital in New Delhi had their numerous risk factors for the development of renal stones examined. Renal stones were conclusively linked to heavy metals such as lead, cadmium, and arsenic (more with lead). Patients with renal stones were found to have a strong correlation with the ff allele of the VDR polymorphism (Fok1 enzymes) [12].

### 2.2 Role of Diet and Water Intake on Stone Disease

Kidney stone production is significantly influenced by nutritional variables. Any dietary practices that the patient may have that make them more likely to develop kidney stones should be thoroughly assessed during their diet. A well-balanced diet has the potential to influence the urinary risk profile and lower the likelihood of urinary stone development. It has been shown that specific dietary therapy, which is based on nutritional assessment and metabolic evaluation, is more efficient in preventing the formation of stones again than generic dietary measures [13].

Urinary abnormalities such as hypercalciuria, hyperoxaluria, hyperuricosauria, hypocitrauria, and excessively acid urine pH might be caused by an unbalanced diet or a sensitivity to certain foods in stone formations. According to several reports, vegetarians have a decreased risk of developing stones than non-vegetarians. One important risk factor for the development of kidney stones is enteric hyperoxaluria in the context of fat malabsorption brought on by various gastrointestinal illnesses [14]. Heavy metals such as cadmium, lead, and arsenic can induce oxidative stress and inflammation in the kidneys. This oxidative stress can disrupt normal cellular function and contribute to the formation of kidney stones [15, 16].

## 3. Etiology of Stone disease

### 3.1 Etiology

Renal tubular acidosis, medullary sponge kidney, Dent's disease, and hyperparathyroidism are among the basic metabolic disorders that lead to kidney stones. Stone sizes are often expressed in one or two dimensions, with the biggest diameters of up to 5, 5–10, 10–20, and > 20 mm being categorized. Anatomical positions of the upper, middle, or lower calyx; renal pelvis; upper, medium, or distal ureter; and urinary bladder can all be used to categorize stones.

### 3.2 Stones etiology characterization

The stones can be classified as drug stones, genetic stones, infectious stones, and non-infectious stones. The components of non-infection stones are uric acid compound, calcium phosphate (which includes brushite and carbonate apatite), and calcium oxalate. Ammonium urate, carbonate apatite, and magnesium ammonium phosphate make up the infected stones. The genes for xanthine, 2,8-dihydroxyadenine, and cysteine are the causes of stones.

## 4. Ethno Medical/ Herbal Treatments

When it comes to treating the health issues of traditional cultures, ethno-medical systems and herbal remedies play a critical role. Worldwide interest in ethno-botanical studies has surged in recent years due to the use of plants in traditional medicine. Indeed, according to estimates from the World Health Organization (WHO), 70% of people worldwide treat a variety of illnesses with traditional or folk (ethno) medicine. The practice of using medicinal plants as a weapon against illness has a long history and is a valuable legacy that has been passed down from generation to generation. The study examined 45 plant species that the residents of Pauri Garhwal's interior communities used in various formulations as anti-urolithiasis plants. 33 families comprise the 39 angiosperms, 1 gymnosperm, and 5 pteridophytes found in medicinal plants. There is evidence of anti-urolithiasis potential in 44 genera [17]. In order to assess the sources of medicinal plants, a phytogeographical survey for ethnomedical plants was recently carried out in the Rayagada district of Odisha. According to the report, 20 families and 30 unique species of plants are used in herbal treatments to treat kidney stones and urinary tract problems [18].

The combination of Dolichos biflorus hydroalcoholic seed extract and Crataeva nurvala aqueous stem bark extract, 1 to 3, had the strongest antiurolithiatic effect. There were seen regenerate glomeruli. The levels of calcium and oxalate in the urine were decreased. Alkaloids, glycosides, flavonoids, saponins, and terpenoids are all present in Crataeva nurvala [19]. When compared to the placebo group, the treatment group of patients (n = 31) with stones ranging in size from 5 to 10 mm significantly decreased the size of calculi by 33.04% (p = 0.017). Results, however, did not show statistical significance for calculi larger than 10 mm in diameter. Crataeva nurvala has an anti-crystallization effect and reduced the amounts of oxalate in urine and renal tissue [20]. The findings from animal studies are corroborated by in vitro study, which also implies that Tribulus terrestris guards against kidney damage caused by calcium oxalate [21]. In albino rats, Tribulus terrestris demonstrated a notable dose-dependent defense against urolithiasis brought on by the implantation of glass beads [22].

Strongly inhibiting calcium oxalate crystallization, it may promote the synthesis of a more soluble calcium oxalate salt

 

form and the subsequent dissolution of that form in urine. Research conducted in vivo has demonstrated that it possesses antibacterial properties and inhibits the crystallization of calcium oxalate [23]. Renal stone sufferers in Egypt and other countries have long utilized tea made from the fruits of Ammi visnaga. This fruit's aqueous extract hastened the kidneys' breakdown of cystine stones. The fruit and its two main ingredients, visnagin and khellin, shown favorable effects in the treatment of hyperoxaluria-induced kidney stone disease [24]. In a human trial, 1000 mg of evening primrose seed oil taken daily markedly raised urinary citraturia (levels of citrate in the urine) while lowering calcium, oxalate, and the kidney stone risk index, or Tiselius risk index [25].

The list of important ethno medicinal plants used in stone disease are mentioned in **table 1.**

**Table 1. List of important ethno medicinal plants used in stone diseases.**

| Plant name | Common Name | Family | References |
|---|---|---|---|
| ***Abrus precatorius L.*** | Gurivinda | Fabaceae | 26 |
| ***Abutilon indicum L.*** | Atibala | Malvaceae | 26, 27, 28, 29 |
| ***Achyranthes aspera L.*** | Apamarg | Amaranthaceae | 30, 31, 32 33 |
| ***Aerva lanata L.*** | Pindikura | Amaranthaceae | 26 |
| ***Allium cepa L.*** | Pyaaz | Liliaceae | 30, 34, 35, 36 |
| ***Ananas comosus Merr.*** | Pineapple | Bromeliaceae | 30, 27 |
| ***Argemon mexicana L.*** | Satyanashi | Papaveraceae | 27, 29 |
| ***Asparagus racemosus Willd.*** | Satawar | Lilicaceae | 30, 34, 37 |
| ***Astercantha longifolia Nees.*** | Talmakhana | Acanthaceae | 27, 31, 34 |
| ***Azadirachta indica L.*** | Neem | Meliaceae | 39 |
| ***Beta vulgaris L.*** | Ullam gadda | Amarantrhaceae | 26, 30, 32 |
| ***Boerhaavia diffusa L.*** | Punarnava | Nyctaginaceae | 30, 31, 34, 38, 40 |
| ***Bryophyllum pinnatum (Lam.) Oken.*** | Parnabeej | Crassulaceae | 30, 31 |
| ***Butea monosperma (Lam.) Taub.*** | Palash | Papilionaceae | 27 |
| ***Carica papaya L.*** | Papita | Caricaceae | 27, 31, 42 |
| ***Celosia argentea L. Var. argentea L. Sp.*** | Safed murga | Amaranthaceae | 26 |
| ***Citrus medica L.*** | Sudhi nimma | Rutaceae | 26 |
| ***Clitoria ternatea L.*** | Aparajita | Papilionaceae | 30 |
| ***Coccinia grandis (L.) Voigt*** | Donda | Cucurbitaceae | 25 |
| ***Colocasia esculenta (L.)*** | Chemakura | Araceae | 25 |
| ***Cuminum cyminum L.*** | Jeera | Apiaceae | 27, 31 |
| ***Cynodon dactylon (L.) Pers.*** | Doob | Poaceae | 26 |
| ***Daucas carota L.*** | Gajar | Apiaceae | 27, 28 |
| ***Gomphrena serrata L.*** | Nala gunugu | Amaranthaceae | 26 |
| ***Gossypium herbaceum L.*** | Prathi chattu | Malvaceae | 26, 24 |
| ***Helianthus annuus L.*** | Surajmukhi | Asteraceae | 30, 31 |
| ***Hemidesmus indicus (l.)*** | Anant mul | Periplocaceae | 27, 30, 32 |
| ***Hollarrhena pubescens. (Buch. Ham).Wall. ex. G. Don*** | Indrajaw | Apocynaceae | 28, 29 |
| ***Kalanchoe pinnata (Lamk.) (Bryophyllum calycinum)*** | Panphuti | Craussulaceae | 26-29 |
| ***Lagenaria siceraria (Mol.) Standl.*** | Sorakaya | Cucurbitaceae | 25 |
| ***Lawsonia inermis L.*** | Henna | Lythraceae | 30 |
| ***Macratyloma uniflora (Lamk.) verde. (Dolichos biflorus Linn.)*** | Kulthi | Fabaceae | 25 |
| ***Mentha spicata L.*** | Pudina | Lamiaceae | 25 |
| ***Mimosa pudica L.*** | Lajwanti | Mimosaceae | 26 |
| ***Ocimum tenuiflorum L.*** | Tulsi | Lamiaceae | 25 |
| ***Pedalium murea Linn.*** | Dakhigokhru | Pedaliaceace | 25 |
| ***Pongamia pinnata L.*** | Karanj | Papilionaceae | 27 |
| ***Punica granatum L.*** | Anar | Punciaceae | 25 |

 

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|---|---|---|---|
| ***Raphanus sativus L.*** | Muli | Brassicaceae | 25 |
| ***Ricinus communis L.*** | Arandi | Euphorbiaceae | 28, 40 |
| ***Sesamum orientale L.*** | Til | Pedaliaceae | 26, 40 |
| ***Solanum surratense Burm.f*** | Bhatkataiya | Solanaceae | 40 |
| ***Solanum virginianum L.*** | Nala mulaka | Solanaceae | 25 |
| ***Syzygium cuminii L.*** | Jamun | Myrtaceae | 30 |
| ***Terminalia arjuna (Roxb.) Wight & Arn.*** | Arjuna | Combretaceae | 30 |
| ***Terminalia bellerica (Gaertn.) Roxb.*** | Bahera | Combretaceae | 30, 31 |

## 5. Future Prospective

Further examinations concerning the worldwide predominance and patterns of kidney stones are justified to comprehend the developing scene of this condition. Concentrates on zeroing in on various areas and populaces can give significant experiences into segment examples and hazard factors. There is a requirement for customized dietary mediations and medicines custom-made to individual metabolic profiles. Future exploration ought to investigate the viability of customized dietary treatment in forestalling stone repeat and working on quiet results. More profound investigation of the hereditary and ecological variables impacting stone arrangement can give significant data to take a chance with evaluation and designated intercessions. Figuring out the interchange between hereditary qualities, diet, and natural openings can illuminate techniques for stone avoidance. Proceeded with examination into the viability and components of activity of ethno-clinical medicines and home grown solutions for kidney stones can prompt the advancement of novel therapeutics. Coordinated effort between conventional medication experts and present day medical services experts can work with the combination of ethno-clinical practices into standard medical services frameworks.

## 5. Conclusion

Nephrolithiasis, often known as kidney stones, is a major global health hazard that affects over 10% of the population globally and has been on the rise in recent years. Most kidney stones are calcium-containing stones, which place a significant strain on both patients and healthcare systems. Recurrence rates are significant, with up to 50% of patients having more than one episode within 10 years of the first one, which frequently results in diminished renal function. Kidney stones can develop due to a number of variables, such as dietary habits, environmental conditions, and genetic predispositions. Research has indicated correlations between the development of stones and irregularities in the urinary system, dietary habits, consumption of water, and metabolic conditions such hyperparathyroidism and renal tubular acidosis.

Effective care and prevention measures for kidney stones depend on an understanding of their prevalence and causation. It has been demonstrated that dietary changes, hydration, and tailored pharmacological therapies based on metabolic evaluations can reduce the incidence and recurrence of stone disease. Herbal treatments and ethnomedical systems are additional possible approaches to kidney stone therapy and prevention. Studies on the anti-urolithiasis effects of traditional medicinal plants have produced positive results in both animal and

human studies. It is important to conduct more research and investigation into these natural cures since they might offer supplementary or alternative methods to conventional treatments.

In summary, lowering the worldwide prevalence of nephrolithiasis requires addressing the intricate interplay of genetic, nutritional, and environmental variables linked to kidney stone development. Collectively, researchers, healthcare professionals, and practitioners of traditional medicine can make it easier to build all-encompassing plans that will enhance the quality of life and outcomes for kidney stone sufferers.

**Conflict of Interest**
None

**Acknowledgement**
The authors acknowledge the Dr. Solanki, Head, Rewa Engineering College, Rewa (M.P.) for technical supports and proper guidance.

**Funding Source**
There is no funding agency or organization.

**Authors' Contributions**
Both authors have contributed equally. Dr. Rajesh Pandey guided about the purpose of study.

## References

[1] P. Singh, P. C. Harris, D. J. Sas, and J. C. Lieske, "The genetics of kidney stone disease and nephrocalcinosis," *Nature Reviews Nephrology*, Vol. **18,** Issue. **4,** pp. **224-240, 2022.**
[2] S. A. Howles and R. V. Thakker, "Genetics of kidney stone disease," *Nature Reviews Urology*, Vol. **17,** Issue. **7,** pp. **407-421, 2020.**
[3] Z. Wang, Y. Zhang, J. Zhang, Q. Deng, and H. Liang, "Recent advances on the mechanisms of kidney stone formation," *International Journal of Molecular Medicine*, Vol. **48,** Issue. **2,** pp. **1-10, 2021.**
[4] P. Rungrasameviriya, A. Santilinon, P. Atichartsintop, S. Hadpech, and V. Thongboonkerd, "Tight junction and kidney stone disease," *Tissue Barriers*, Vol. **12,** Issue. **1,** pp. **2210051, 2024.**
[5] I. Sorokin, C. Mamoulakis, K. Miyazawa, et al., "Epidemiology of stone disease across the world," World J Urol, Vol. **35,** pp. **1301–1320, 2017.**

 

[6] A. Carbone et al., "Obesity and kidney stone disease: a systematic review," *Minerva Urologica e Nefrologica The Italian Journal of Urology and Nephrology*, Vol. **70,** Issue. **4,** pp. **393-400, 2018.**

[7] S. Wang, Y. Zhang, X. Zhang, Y. Tang, and J. Li, "Upper urinary tract stone compositions: the role of age and gender," *International Brazilian Journal of Urology*, Vol. **46,** pp. **70-80, 2019.**

[8] C. Grant, G. Guzman, R. P. Stainback, R. L. Amdur, and P. Mufarrij, "Variation in kidney stone composition within the United States," *Journal of Endourology*, Vol. **32,** Issue. **10,** pp. **973-977, 2018.**

[9] G. Tundo, A. Vollstedt, W. Meeks, and V. Pais, "Beyond prevalence: annual cumulative incidence of kidney stones in the United States," *The Journal of Urology*, Vol. **205,** Issue. **6,** pp. **1704-1709, 2021.**

[10] S. K. Soni, R. Pandey, "Interaction of Hazardous Heavy Metals with Human and Environment and their toxicological Impacts," *International Journal of Scientific Research in Biological Sciences*, Vol. **8,** Issue. **5,** pp. **39-45, 2021.**

[11] R. Siener, H. Herwig, J. Rüdy, R. M. Schaefer, P. Lossin, and A. Hesse, "Urinary stone composition in Germany: results from 45,783 stone analyses," *World Journal of Urology*, Vol. **40,** Issue. **7,** pp. **1813-1820, 2022.**

[12] S. Singh et al., "Risk factors of incident kidney stones in Indian adults: a hospital-based cross-sectional study," *Cureus*, Vol. **15,** Issue. **2, 2023.**

[13] R. Siener and C. Metzner, "Dietary weight loss strategies for kidney stone patients," *World Journal of Urology*, Vol. **41,** Issue. **5,** pp. **1221-1228, 2023.**

[14] A. Rodriguez, G. C. Curhan, G. Gambaro, E. N. Taylor, and P. M. Ferraro, "Mediterranean diet adherence and risk of incident kidney stones," *The American Journal of Clinical Nutrition*, Vol. **111,** Issue. **5,** pp. **1100-1106, 2020.**

[15] S. K. Soni, M. K. Solanki, "Role of Wastewater in transportation of Heavy Metals: A risk assessment to Human health," *International Research Journal of Engineering and Technology*, Vol. **10,** Issue. 1**1,** pp. **711-718, 2023.**

[16] R. K. Patel, P. K. Singh , R. Pandey, S. K. Soni, B. Patel, and S. Mishra, "Heavy metals as valuable contaminants and assurance measure of bovine milk for health prospects: An update," *International Journal of Pharmaceutical Research and Applications*, Vol. **6** Issue. **2,** pp. **135-140, 2021.**

[17]. H. Kumar, A. K. Khajuria, and N. S. Bisht, "Traditional phytoremedies used to treat urolithiasis in Pauri (Garhwal) Uttarakhand India," *Journal of Pharmacognosy and Phytochemistry*, Vol. **7,** Issue. **3,** pp. **2941-2944, 2018.**

[18] S. K. Bishoyi and U. P. Tripathy, "Ethnomedicinal plants used in kidney stones and infection of urinary tract by tribal community of Rayagada District, Odisha," International *Journal of Science and Research Archive*, Vol. **8,** Issue. **2,** pp. **102-116, 2023.**

[19] S. Kaushik, M. Choudhary, and S. Rajpal, "Antiurolithiatic efficacy of combination preparations of Dolichos biflorus and Crataeva nurvala: folk medicines used in Indian traditional medicine," *Future Journal of Pharmaceutical Sciences*, Vol. **7,** Issue. **1,** pp. **1-7, 2021.**

[20] D. M. Kasote, S. D. Jagtap, D. Thapa, M. S. Khyade, and W. R. Russell, "Herbal remedies for urinary stones used in India and China: A review," *Journal of Ethnopharmacology*, Vol**. 203,** pp. **55-68, 2017.**

[21] F. Khan, M. F. Haider, M. K. Singh, P. Sharma, T. Kumar, and E. N. Neda, "A comprehensive review on kidney stones, its diagnosis and treatment with allopathic and ayurvedic medicines," *Urology & Nephrology Open Access Journal*, Vol. **7,** Issue. **4,** pp. **69-74, 2019.**

[22] B. Patel, "Herbal Alternative for Kidney Stone Diseases," *Journal of Drug Delivery and Therapeutics*, Vol. **9,** Issue. **4,** pp. **702-704, 2019.**

[23] F. Khan, M. F. Haider, M. K. Singh, P. Sharma, T. Kumar, and E. N. Neda, "A comprehensive review on kidney stones, its diagnosis and treatment with allopathic and ayurvedic medicines," *Urology and Nephrology Open Access Journal*, Vol. **7,** Issue. **4,** pp. **69-74, 2019.**

[24] W. Abbas, M. Akram, and A. Sharif, "Nephrolithiasis; prevalence, risk factors and therapeutic strategies: a review,". *Madridge J. Intern. Emerg. Med*, Vol. **3,** Issue **3,** pp. **90-5, 2019**

[25] D. M. Kasote, S. D. Jagtap, D. Thapa, M. S. Khyade, and W. R. Russell, "Herbal remedies for urinary stones used in India and China: A review," *Journal of Ethnopharmacology*, Vol. **203,** pp. **55-68, 2017.**

[26] Dhanvantari krit, Bharatiya Jadi Butiyan; *D.P.B. Publication*, Delhi; pp. **1-698, 2010.**

[27] S. Aryal, P. Kuwar, and C. Thapa, "Antiurolithiatic activity of selected plants extracts against calcium oxalate crystals," J. Med. Plants Res., Vol. **15,** Issue. **4,** pp. **172-177, 2021.**

[28] A. Yadav, R. Das, and D. K. Mehta, "Benefaction of Herbals in the Management of Urolithiasis," Curr. Tradit. Med., Vol. **7,** Issue. **4,** pp. **541-551, 2021.**

[29] S. R. Ghatapanadi, N. Johnson, and A. H. Rajasab, "Medicinal plants of North Karnataka used in treatment of kidney stones and urinary tract infections," *The Socioscan*, Vol. **2,** Issue. **3-4**, pp. **23-24, 2010.**

[30] Acharya Balakrishna, Ayurveda – Jadi Buti Rahasya, *Divya Publication, Patanjali yogpeetha*, **1-419, 2008.**

[31] Brahmavarchas, "Ayurveda Ka Praan- Van Aushadhi Vigyan", *Yug Nirman Vistar Trust, Gayatri Tapobhumi, Mathura*, **1- 474, 2010.**

[32] D. M. Awari, V. Mute, S. P. Babhale, and S. P. Chaudhari, "Antilithiatic effect of Achyranthus Aspera Linn.," Leaves extract on ethylene glycol induced nephrolithiasis," J. Pharm. Res., Vol. **2,** Issue. **5,** pp. **994-997, 2009.**

[33] D. M. Awari, V. Mute, S. P. Babhale, and S. P. Chaudhari, "Antilithiatic effect of Achyranthus Aspera Linn.," Leaves extract on ethylene glycol induced nephrolithiasis," *Jouranl of Pharm. Research*, Vol. **2,** Issue**. 5,** pp. **994-997, 2009.**

[34] D. Chandra, "Van Aushadhi Jadibuti; Chitravali", *Hindi Seva Sadan, Mathura*, **25-642, 2009.**

[35] S. Tiwari, "Plants: A Rich Source of Herbal Medicine," J. Nat. Prod., Vol. **1,** pp. **27-35, 2008.**

[36] K. P. S. Kumar, D. Bhowmik, Chiranjib, Biswajit, and P. Tiwari, "Allium cepa: A traditional medicinal herb and its health benefits," *Journal of Chemical and Pharmaceutical Research*, Vol. **2,** Issue. **1,** pp. **283- 291, 2010.**

[37] AJM Christina, Antilithiatic effect of Asparagus racemosus willd on ethylene glycol induced lithiasis in male albino Wistar rats," *Methods and findings in experimental and clinical pharmacology*, Vol. **27,** Issue. **9,** pp. **633, 2005.**

[38] M. Sharma, A. Sharma, and A. Kumar, "Ethnopharmacological importance of Asparagus racemosus: A review," J. Pharm. Biomed. Sci., Vol. **6,** Issue. **12,** pp. **1-12, 2011.**

[39] S. M. Blake and C. P. Blake, "Kidney stone risk reduction and size reduction utilizing medical plants," *GSC Biological and Pharmaceutical Sciences*, Vol. **21,** Issue. **1,** pp. **080-088, 2022.**

[40] N. Sharma, B. S. Tanwer, and R. Vijayvergia, "Study of medicinal plants in Aravali regions of Rajasthan for treatment of Kidney stone and Urinary tract troubles," *International Journal of PharmTech Research*, Vol. **3,** Issue. **1,** pp. **110-113, 2011.**

[41] K. Mikawlrawng, S. Kumar, and Vandana, "Current scenario of urolithiasis and the use of medicinal plants as antiurolithiatic agents in Manipur (North East India): A Review," *International Journal of Herbal Medicine*, Vol. **2,** Issue. **1,** pp. **1-12, 2014.**

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