



Review article

Navigating urolithiasis treatment: the role of allopathic and herbal medicines

Mamatha H S^{*1}, Ashok Kumar BS², Disha N S³, Mohammed Khalid¹, Chaya G⁴¹ Department of Pharmaceutics, R. L. Jalappa College of Pharmacy, Sri Devaraj Urs Academy of Higher Education And Research, Kolar, Karnataka, India² Department of Pharmacognosy, R. L. Jalappa College of Pharmacy, Sri Devaraj Urs Academy of Higher Education And Research, Kolar, Karnataka, India³ Department of Pharmaceutical Chemistry, R. L. Jalappa College of Pharmacy, Sri Devaraj Urs Academy of Higher Education And Research, Kolar, Karnataka, India⁴ Department of Pharmacology, Akash institute of Pharmacy, Bangalore, Karnataka, India**Corresponding author:** Mamatha H S, ✉ shreemamatha6@gmail.com, **Orcid Id:** <https://orcid.org/0009-0009-9017-9035>

Department of Pharmaceutics, R. L. Jalappa College of Pharmacy, Sri Devaraj Urs Academy of Higher Education And Research, Kolar, Karnataka,, India

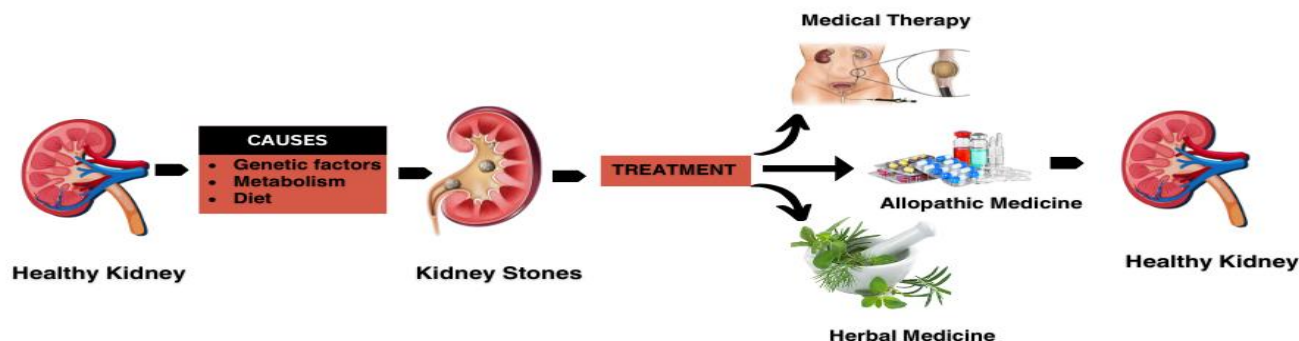
© The author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by-nc/4.0/>). See <https://jmpas.com/reprints-and-permissions> for full terms and conditions.**Received - 17-10-2024, Revised - 27-11-2024, Accepted - 09-12-2024 (DD-MM-YYYY)**

Refer This Article

Mamatha H S, Ashok Kumar BS, Disha N S, Mohammed Khalid, Chaya G, 2024. Navigating urolithiasis treatment: the role of allopathic and herbal medicines. Journal of medical pharmaceutical and allied sciences, V 13 - I 6, Pages - 6921 – 6928. Doi: <https://doi.org/10.55522/jmpas.V13I6.6730>.

ABSTRACT

Urolithiasis is the stone formation in the urinary tract, affects an estimated 33% of the world's population with the male being the common victim due to hormonal causes. The condition results from a variety of causes like dietary habits, genetic predispositions, metabolic disturbances, and environmental factors. Among all types of kidney stones, calcium oxalate is most commonly found, followed by struvite, uric acid, and cystine stones. These can be very common symptoms for someone diagnosed with urolithiasis. There are some medicinal, surgical, and herbal therapies to treat the ailment. The allopathic treatments have ranged from drugs like thiazides and potassium citrate for controlling the symptom, and ESWL for severe stones, to more drastic surgical interventions like PCNL. side effect includes stomach discomfort or even rashes on the skin. Herbal remedies, such as Tribulus terrestris and Berberis vulgaris, provide an adjunctive therapy due to their nephroprotective, anti-lithic, and anti-inflammatory effects. These natural therapies both prevent stone formation and dissolve those already formed, and are both less side-effecting and cheaper than synthetic drugs. Both allopathic and herbal treatments emphasize the need for patient-specific treatment according to disease severity, patient preference, and side effects. A multi-modality treatment that encompasses the benefits in relation to individual risk factors can improve the quality of life of patients with urolithiasis. It shows the importance of every factor related to this widespread condition for better care of patients.

**Keywords:** Urolithiasis, Medicinal plants, Diuretics, Stone, Crystalline, Urinary tract.

INTRODUCTION

The term urolithiasis has Greek origin. Lithos in Greek means stone, oros means flow, and ouron means urine. It means the formation of concretions in the lumen of a urinary tract and which are firmly attached to the uroepithelium and consist of crystalline substance and proteins. ^[1] Gall stone formation is one of the most painful urologic diseases which affects a 13% of the global population. It is significantly more common in males, about 70-81% and in females 47-60% ^[2, 3]. It occurs mostly in the people of about 20 to 40 years of age and in both sexes ^[4], male predominance because testosterone hormone has enhancing activity to create the stone and oestrogen hormone has inhibiting activity in formation of stone. ^[5] Kidney stones are also created through an imbalance system in the body. Calcium containing stones are divided into: There are calcium-containing stones, which include calcium phosphate and calcium oxalate, struvite calculi, uric acid and cystine calculi, and there are few other different types' calculi. During the past decades many herbs have been discovered possibly to affect the case of renal calculi from the ancient time. ^[6] The medicinal plants are widely used most conventionally for the treatment of urolithiasis since they have lower side effects and cost effective and those that have shown positive effects ^[7, 8]. The stones could be composed of calcium phosphate, struvite, uric acid, cystine and calcium oxalate. It has been found that oxalate is constant in stones, and is found in over 80% cases of uroliths ^[9].

Figure 1: Anatomy of kidney

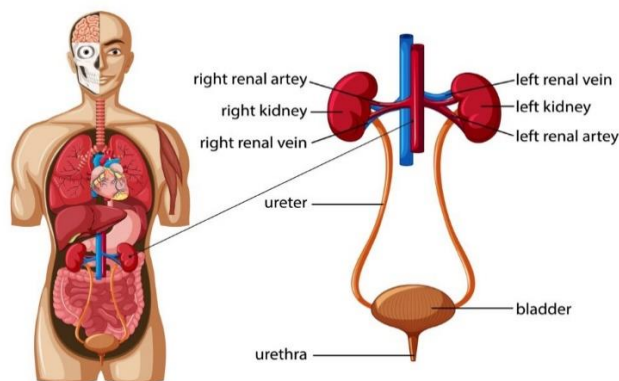
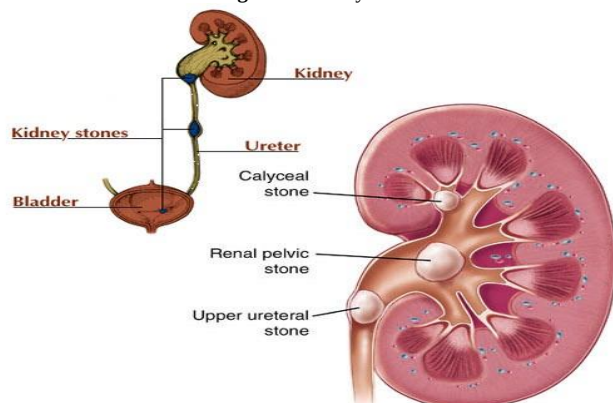


Figure 2: kidney stones



Signs and symptoms

Sharp tenderness back & side at waist below the rib line

Lower abdominal pain.

Pink, red or brown urine

Pain during urination

Nausea and vomiting

Cloudy or foul-smelling urine

Frequently Urinating

Fever and chills ^[10-15].

Pathophysiology

Kidney stones are associated with red-colored urine and severe tenderness in the mid-section, back, lower abdomen pain. The crystals of stone material can only form if urine is supersaturated concerning the stone material that is the content of stone material in it should be more than its thermodynamic solubility ^[16]. Over concentrated urine often leads to formation of renal calculi. This leads to precipitation of crystals at the inner walls of the kidneys; they are and calcium, and oxalate, phosphate and other compounds of the urine. Which may be formed when these crystals combine. Kidney oxalate stones are formed when the urine becomes oversaturated with specific urinary salts, and calcium oxalate is one of them.

Risk Factors

The following conditions may raise the chance of kidney stones developing ^[17-20].

Diet

High Consumption of Animal Protein

High animal protein, rises acid level, this leads to decrease of calcium & uric acid & rises of the citrate excretion in urine. Citrate excretion is low among individuals whose diet is rich in Animal protein.

Low Consumption of Fluids

Low water intake leads to renal calculi. Renal stones are formed by increasing the urine supersaturation this leads to formation of crystals uric acid stones require the hyperuricosuria persist with low Ph, with decreasing solubility at pH 5 ^[21, 22].

Vitamin

Increased in the amount of Vitamin C leads to formation of kidney stones. Vitamin C promotes the intestinal absorption of calcium, too much of it may raise the risk of stone development. ^[23, 24].

Electrolytes

Calcium is the electrolytes that leads to the formation of renal calculi. Consumption of fluoridated water is probably likely to form renal calculi. High dietary potassium leads to formation of renal calculi, potassium enhances the excretion of citrate in the urine.

Treatment of Kidney Stones

Medical Therapy

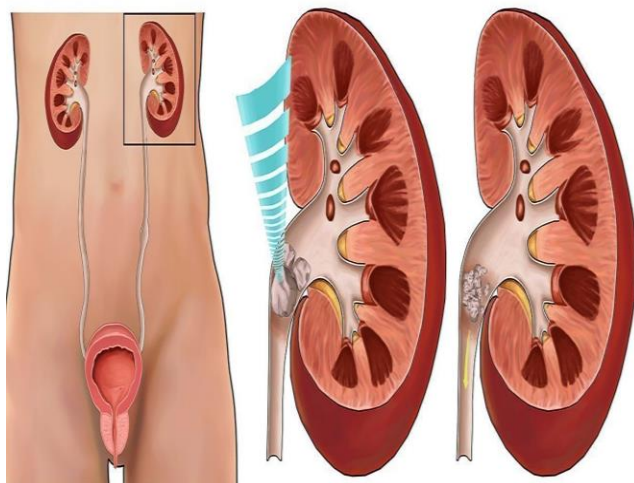
Stone disease treatment involves surgical extraction of the stone which means waiting for the stone to pass. Small stones, stones

are less than 5mm in size, have a high incidence of passing through the urinary system which may take 40 days [25, 26].

Extracorporeal Shockwave Lithotripsy

Non-electrical shock waves are generated from outside the body, they are passed through the skin & tender tissues of the body and focused on the large stones. Stones become grainy and are then passed. ESWL devices are classified into several forms. The patient lies down in water bath while the shock waves are delivered on patient. ESWL is contra-indicated for those who have stones larger than 2 cm; approximately 0.8 inch in diameter.

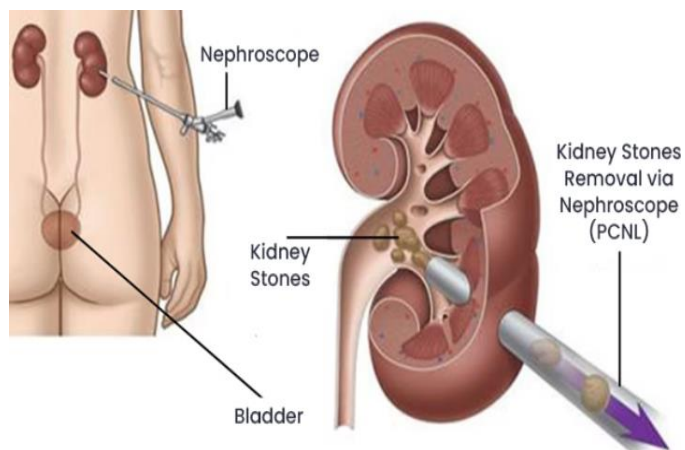
Figure 3: Extracorporeal Shockwave Lithotripsy



Percutaneous Nephrolithotomy

A nephroscope is endoscopically inserted through a track made along a patient's spinal column during percutaneous nephrolithotomy (PCNL) to extract medium or greater sized renal calculi from a patient's urinary tract. PCNL eliminate renal calculi, PCNL responsible for pain, urinary tract obstruction or bleeding and urinary tract infections [27].

Figure 4: Percutaneous Nephrolithotomy

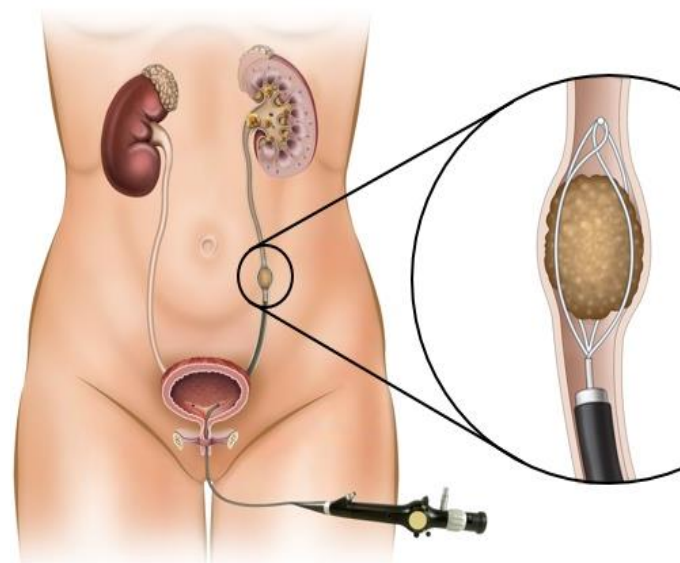


Ureteroscopic

In Ureteroscopic passes a slim narrow tube holding a camera and light through the urethra and into a bladder & up the ureter, ureteroscopic stone removal is done. The surgeon employs a mechanical form of a cage to extract it or perhaps a tool that generates a shock wave to disintegrate it. In order to enhance healing

process of the ureter's lining, it may be necessary to place a small tube into the ureter and leave it there for several days after treatment [28, 29].

Figure 5: Ureteroscopic Stone Removal



Allopathic Medicines

The type, size of the stone can also use to decide medication. The medications employed in the treatment of stones are discussed below [30-34].

Thiazides

Thiazides are best medicine for kidney stones, which elevates calcium level in urine. These medications help the kidneys filter out extra calcium in urine and prevent calcium stones from forming [35].

Potassium Citrate

Potassium citrate is effective and increase urinary citrate levels, uric acid, calcium and those who have low citrate excretion. Potassium citrate turns urine to alkaline substance as it dissolves in it. This characteristic enables passing the chance of forming uric acid and cystine stones. The citrate level in urine increased [36].

Allopurinol

Gout is treated with allopurinol, which raises blood levels of a uric acid that accumulate in joint cavities. The elevated levels of uric acid in the blood and urine are reduced by allopurinol. It is also recommended to avoid kidney stones caused by calcium and uric acid [37, 38, and 39].

Acetohydroxamic Acid (AHA)

AHA has the beneficent action to decrease the pH of urine and capability to inhibit the formation of stones.

In preventing the activity of recurring UTIs, which are instigated by specific types of bacteria, the formations of struvite stones are prevented [40].

Herbal Drugs

Accumulates Kidney stones are treated with natural medication which include the following [41-46].

Celosia Argental (Viratarvadigana)

Urinary stones are treated specifically in the Indian medical system. Stones are dissolved and eliminated by using its aqueous decoction. *Celosia argental* which dissolves kidney stones [47].

Figure 6: *Celosia argental****Fenugreek seed (Trigonella foenum-graecum)***

In northern Africa, kidney stones are treated with the seeds of Fenugreek. Which lower kidney calcification and aid in the prevention of kidney stones [48].

Figure 7: *Fenugreek seed****Chanca piedra Stonebreaker (Phyllanthus niruri)***

The Chanca stone breaker helps to pass kidney stones. Daily consumption of this herb helped to avoid kidney stones formation [49].

Figure 8: *Chanca piedra/Stonebreaker****Gokshura Fruit/root***

This herb is also an Ayurvedic Rasayana & utilized in China and India to cure urinary track disorders. It has been observed to be effective in the treatment of early-stage urolithiasis. tribulus equally protects against kidney affection induces calcium oxalate [50].

Figure 9: *Gokshura fruit/root****Origanum Vulgare***

This plant is a common spice and medicine due to its lithotripter, diuretic, and anti-antispasmodic qualities. The crude aqueous metabolic extract have an invitro inhibitory impact on calcium oxalate crystal nucleation and aggregation, as well as a decrease in crystal yield in an unpleasant calcium oxalate solution [51].

Figure 10: *Origanum vulgare****Barberry root bark (Berberis vulgaris)***

Extract from barberry roots' bark was ascertain to guard the kidneys against oxidation and prevent calcium oxalate from solidifying [52].

Figure 11: *Barberry root bark*

Varuna Bark (*Crataeva nurvala*)

The Ayurvedic herb on a daily basis lowers the excretion of calcium in the urine and avoids kidney stones. It can be used with banana stem, which also helps to avoid kidney stones. The use of *Varuna bark* decreases pain, made it easier to pass renal calculi, and helped dissolve kidney stones [54].

Figure 12: Varuna bark**Ammi Visnaga**

The patients with kidney stones have used a variety of teas prepared from Ammi visnaga fruits. The fruit's aqueous extract speeds up the disintegration of kidney stones [55].

Figure 13: Ammi visnaga**Punarnava Herb (*Boerhaavia Diffusa*)**

Punarnava herb is common Indian weed used in kidney reconstructive and to eliminate kidney stones. In an in vitro study it was able to prevent formation of struvite stones; in vivo is not clear [56].

Figure 14: Punarnava herb**Hibiscus Sabdariffa**

Hibiscus sabdariffa is used to eradicate and act as a rebellious to kidney stones. By intake of *Hibiscus sabdariffa* leads to decrease in formation of stone [57].

Figure 15: Hibiscus sabdariffa**Comparison of Allopathic Medicine and Herbal Medicine**

Allopathic medicines and herbal medicines are used in the treatment of urolithiasis. Allopathic treatment mostly revolves around the management of symptoms and dissolving the stone, along with medications and preventing the formation includes thiazides, potassium citrate, and allopurinol. It is enacted through regulation of calcium, increasing urinary citrate or by lessening of uric acid so that they may not form a stone. It may cause some side effects like stomach upset or skin rashes. Medicinal therapies such as ESWL or surgery are employed to eliminate intact renal stones bigger than 2cm.

Herbal medicine on the other hand employs the use of plant borne medicine that asserts an ability to break the stones and promote kidney functioning with minimal side effects. *Tribulus terrestris*, *Phyllanthus niruri* and *Berberis vulgaris* as nephroprotective, anti-lithic and anti-inflammatory plants. These herbs apart from preventing the formation of stones also effectively breaks it in to smaller parts and keep off recurrences through stimulation of urine formation and reduction of oxidation stress in the body. Traditional healings are in most cases felt to be safer and cheaper than the synthetic products hence being used to offer cheap cures.

Allopathic treatments might be more effective as are quicker acting but in chronic cases or for support, herbal remedies are useful because they are much safer [58-60].

CONCLUSION

Urolithiasis refers to the formation of calculi in the urinary tract due to dietary habits, genetic predisposition, hormonal effects, and especially due to testosterone. These stones are majorly composed of calcium oxalate, uric acid, or struvite. These stones occur when urine becomes supersaturated with stone-forming compounds. Small stones are usually dealt conservatively to control pain. Larger stones often require intervention in the form of ESWL or PCNL. Pharmacological interventions, such as thiazides, potassium

citrate, and allopurinol, are generally designed to prevent recurrence and modify urine chemistry. Supporting these strategies are natural remedies like *Celosia argentea*, fenugreek seeds, and Chanca piedra, which are safe and side effect-free diuretics with anti-inflammatory properties. Herbal treatments prioritize safety and reduced cost, indicating a commitment to patient-centered care. Treatment tailored to the individual needs ensures maximum management based on risk factors, paying a fine balance between modern medicine and traditional medicine.

REFERENCES

- Chandra Shekhar Tailor, Anju Goyal, 2015. Isolation of Phytoconstituents and in vitro antilithiatic by Titrimetric method, Antioxidant activity by 11-diphenyl -2-picryl hydrazyl scavenging assay method of alcoholic roots and rhizomes extract of *Hedychiun coronary J. koenig* plant species. *Asian Journal of Pharmaceutical and Clinical Research*. 8(4), Pages 225-229.
- Soundararajan P, Mahesh R, Ramesh T, et.al, 2006. Effect of *Aerva Lanata* on calcium oxalate urolithiasis in rats. *Indian Journal of Experimental Biology*. 44, Pages 981-986.
- Arun K Khajuria, NS Bisht, 2017. Ethnomedicinal plants used to treat Nephrolithiasis: A case study Pauri (PAURI Garhwal), Uttarakhand. *International Journal of Herbal Medicine*. 5(1), Pages 10-13.
- Goyal Parveen Kumar, Mittal Arun, Kumar Rishi, et.al, 2011. Evaluation of *Tinosporacordifolia* for Anti-urolithiatic Potential. *Journal of Pharmaceutical and Biomedical Sciences*. 9(14), Pages 10-13.
- Kalpna Devi V, Baskar R, Varalakshmi P, et.al, 1993. Biochemical effects in normal and stone forming rats treated with the ripe kernel juice of Plantain (*Musa Paradisiaca*). *Ancient Science of Life*. 3(4), Pages 451 – 461.
- Bashir S, Gilani AH, Siddiqui AA, et.al, 2010. *Berberis vulgaris* root bark extract prevents hyperoxaluria induced urolithiasis in rats. *Phytotherapy Research*. Pages 1250–1255. Doi: 10.1002/ptr.3196.
- Yadav RD, Jain SK, Alok S, et al, 2011. Herbal plants used in the treatment of urolithiasis: a review. *International Journal of Pharmaceutical Sciences and Research*. 2(6), Pages 1412-1420.
- Cook J, Lamb BW, Lettin JE, et.al, 2016. The epidemiology of urolithiasis in an ethnically diverse population living in the same area. *Endurology and Stone Disease*. 13(4), Pages 2754-2758.
- Mittal A, Tandon S, Singla SK, et.al, 2016. In vitro inhibition of calcium oxalate crystallization and crystal adherence to renal tubular epithelial cells by *Terminalia arjuna*. *Urolithiasis*. 44, Pages 117– 125. Doi: 10.1007/s00240-015-0822-0.
- Hinkle J.L., Cheever K. 2014. The 13th edition of Brunner & Suddarth's Textbook of Medical-Surgical Nursing. Lippincott, Williams & Wilkins, Philadelphia, Pa.
- Lewis's 2007. Medical –Surgical Nursing. Second edition. 2, Pages 1129-1133.
- Maso T, Sujihata, 2008. The role of urinary kidney stone inhibitors and promoters. *International Journal of Urology*. Pages 115-120. Doi: 10.1016/j.jeeus.2007.03.002.
- Doddametikkur Ramegowada, Chandra, Shekhar Biyani, Antony J B, et.al, 2007. The role of urinary kidney stone inhibitors and promoters in the pathogenesis of calcium containing renal stones. . *International Journal of Urology*. 5, Pages 126-136. Doi: 10.1016/j.jeeus.2007.03.002.
- Ernst, E, 2007. Herbal medicines: balancing benefits and risks. *Novartis FoundSeep*. 282, Pages 154-67. Doi: 10.1002/9780470319444.ch11.
- Deepika RM, Ravisankar P, Priya JD, et.al, 2018. Renal calculi: A comprehensive review. *Ind J Res Pharm Biotechnol*. 6(1), Pages 30–34.
- Scoffone CM, Cracco CM, 2018. Pediatric calculi: Cause, prevention and medical management. *Curr Opin Urol*. 28(5), Pages 428–432. Doi: 10.1097/MOU.0000000000000520.
- Wang J, Bai Y, Yin S, et.al, 2020. Risk factors for deterioration of renal function after percutaneous nephrolithotomy in solitary kidney patients with staghorn calculi. *Transl Androl Urol*. 9(5), Pages 2022. Doi: 10.21037/tau-20-916.
- Pan D, Hong D, Wang F, et al, 2022. The high risk factors and preventive measures of percutaneous nephrolithotomy under the guidance of B-ultrasound in the treatment of postoperative renal calculi. *Evid Based Complement Alternat Med*. Doi: 10.1155/2022/1287910
- Taylor EN, Curhan GC, 2004. Dietary factors and the risk of incident kidney stones in men: new insights after 14 years of follow-up. *J Am Soc Nephrol*. 15(12), Pages 3225-3232. Doi:10.1097/01.ASN.0000146012.44570.20.
- Curhan GC, Willett WC, Knight EL, et.al, 2004. Dietary factors and the risk of incident kidney stones in younger women: Nurses' Health Study II. *Arch Intern Med*. 164(8). Pages 885-91. Doi: 10.1001/archinte.164.8.885.
- Thomas L, Elinder CG, Tiselius HG, et.al, 2013. Ascorbic acid and risk of kidney stones. *Nephrol Dial Transplant*. 28(4), Pages 1398-1405. Doi:10.1093/ndt/gfs596.
- Ticinesi A, Nouvenne A, Maalouf NM, et al, 2020. Diet, gut microbiota, and kidney stone disease: a literature review. *Adv Nutr*. 11(4), Pages 881-890. Doi: 10.1016/j.kint.2019.03.020.
- Coll DM, Varanelli MJ, Smith RC, et.al, 2002. Relationship of spontaneous passage of ureteral calculi to stone size and location as revealed by unenhanced helical CT. *AJR Am J Roentgenol*. 178, Pages 101-103. Doi: 10.2214/ajr.178.1.1780101.
- Knoll T, 2007. Stone disease. *EurUrolSuppl*. 6, Pages 717-722. Doi: 10.1016/j.jtcme.2015.12.004.
- Cicerello E, Merlo F, Gambaro G, et.al, 2011. Effects of alkaline citrate therapy on clearance of residual renal stone fragments after ESWL in sterile calcium and infection nephrolithiasis patients. *J Urol*. Pages 5-9. Doi: 10.1016/s0022-5347(17)34858-9.

26. Silberstein J, Lakin CM, Kellogg Parsons J, et.al, 2008. Shock wave lithotripsy and renal hemorrhage. *Rev Urol.* 10, Pages 236-241.
27. Fine JK, Pak CYC, Preminger GM, et.al, 2010. Effect of medical management and residual fragments on recurrent stone formation following shock wave lithotripsy. *J Urol.* 153, Pages 27-33. Doi: 10.1097/00005392-199501000-00010.
28. Holmes RP, Goodman HO, Assimios DG, et.al, 2001. Contribution of dietary oxalate to urinary oxalate excretion. *Kidney Int.* 59(1), Pages 270–276. Doi: 10.1046/j.1523-1755.2001.00488.x.
29. Duncan SH, Richardson AJ, Kaul P, et.al, 2002. Oxalobacter formigenes and its potential role in human health. *Appl Environ Microbiol.* 68(8), Pages 3841–3847. Doi: 10.1128/AEM.68.8.3841-3847.2002.
30. Grentz L, Massey LK, et.al 2002. Contribution of dietary oxalate to urinary oxalate in health and disease. *Top Clin Nutr.* 17(2), Pages 60–70. Doi: 10.1097/00008486-200203000-00010.
31. Moe OW, Pearle MS, Sakhaee K, et.al, 2011. Pharmacotherapy of urolithiasis: Evidence from clinical trials. *Kidney Int.* 79(4), Pages 385–392. Doi: 10.1038/ki.2010.389.
32. Bhattacharya S, Joshi NK, Jain YK, et.al, 2022. Dietary determinants of renal calculi: A case-control study from a tertiary care hospital of western Rajasthan. *Cureus.* 14(11), Pages e31460. Doi: 10.7759/cureus.31460.
33. Hess B, Jost C, Zipperle L, et al 1998. High-calcium intake abolishes hyperoxaluria and reduces urinary crystallization during a 20-fold normal oxalate load in humans. *Nephrol Dial Transplant.* 13(9), Pages 2241–2247. Doi: 10.1093/ndt/13.9.2241.
34. Duncan SH, Richardson AJ, Kaul P, et al, 2002. Oxalobacter formigenes and its potential role in human health. *Appl Environ Microbiol.* 68(38), Pages 41– 47. Doi: 10.1128/AEM.68.8.3841-3847.2002.
35. Holmes RP, Goodman HO, Assimios DG, et.al, 2001. Contribution of dietary oxalate to urinary oxalate excretion. *Kidney Int.* 59(1), Pages 270–276. Doi: 10.1046/j.1523-1755.2001.00488.x.
36. Dujardin T., 2014. Uric acid stone disease: allopurinol treatment. *Rev Urol.* 16(2), Pages 67-72. Doi: 10.1016/s0140-6736(73)90197-9.
37. Krambeck A.E., et al, 2009. "Effect of allopurinol on uric acid stone recurrence: a randomized controlled trial." *The Journal of Urology.* 181(5), Pages 2053-2058. Doi: https://doi.org/10.1016/j.juro.2008.12.025.
38. Grentz L, Massey LK, 2002. Contribution of dietary oxalate to urinary oxalate in health and disease. *Topics in Clinical Nutrition.* 17, Pages 60–70. Doi: 10.1097/00008486-200203000-00010.
39. Alfuhigi ZD, Alfuhigi AO, Sulaiman AH, et.al, 2018. Renal stones among adult population in Arar City, Northern Saudi Arabia. *Egypt J Hosp Med.* 71(5), Pages 70-80.
40. Khan F, Haider MF, Singh MK, S et.al, 2019. A comprehensive review on kidney stones, its diagnosis and treatment with allopathic and ayurvedic medicines. *Urol Nephrol.* 7(4), Pages 69–74. Doi: 10.15406/unoaj.2019.07.00247.
41. Singh R, 2019. Medicinal plants used in the treatment of kidney, urinary and gallstone (renal stone and herbal treatment): A review. *Int J Pharm Res Med Plants.* 2(1), Pages 82-86.
42. González AF, Pieters L, Hernández RD, et.al, 2020. Effectiveness of herbal medicine in renal lithiasis: A review. *Siriraj Med J.* 72(2), Pages 188–194. Doi: https://doi.org/10.33192/Smj.2020.25.
43. Nimavat A, Trivedi A, Yadav A, et.al, 2022. A review on kidney stone and its herbal treatment. *J Pharm Pharmacol.* 10, Pages 195–209.
44. Rasool M, Mousa T, Alhamadani H, et.al, 2022. Therapeutic potential of medicinal plants for the management of renal stones: A review. *Baghdad J Biochem Appl Biol Sci.* 3(2), Pages 69–98. Doi: 10.47419/bjbabs.v3i02.133
45. Baxmann AC, Mendonca CD, Heilberg IP, et.al, 2003. Effect of vitamin C supplements on urinary oxalate and pH in calcium stone-forming patients. *Kidney Int.* 63(3), Pages 1066–1071. Doi: 10.1046/j.1523-1755.2003.00815.x.
46. Goldfarb DS, Asplin JR, et.al, 2001. Effect of grapefruit juice on urinary lithogenicity. *J Urol.* 166(1), Pages 263–267.
47. Dey J, Creighton A, Lindberg JS, et al, 2002. Estrogen replacement increased the citrate and calcium excretion in rates in postmenopausal women with recurrent urolithiasis. *J Urol.* 167(1), Pages 169–171.
48. Eskelinen M, Ikonen J, Lipponen P, et.al, Usefulness of history-taking, physical examination and diagnostic scoring in acute renal colic. *Eur Urol.* 34(6), Pages 467–473. Doi: 10.1159/000019785.
49. Akram M, Idrees M, 2019. Progress and prospects in the management of kidney stones and developments in phytotherapeutic modalities. *Int J Immunopathol Pharmacol.* 33, Pages 2058738419848220. Doi: 10.1177/2058738419848220.
50. Chandhoke P, 2002. When is medical prophylaxis cost effective for recurrent calcium stones? *J Urol.* 168(3), Pages 937–940. Doi: 10.1016/S0022-5347(05)64546-6.
51. Mansoor Shahiba R, 2020. Tamsulosin versus tadalafil as a medical expulsive therapy for ureteric calculus: An open labelled randomized comparative study, Tirunelveli Medical College. Doi: 10.4111/icu.2016.57.5.351.
52. Khan F, Haider MF, Singh MK, et.al, 2019. A comprehensive review on kidney stones, its diagnosis and treatment with allopathic and ayurvedic medicines. *Urol Nephrol.* 7(4), Pages 69–74. Doi: 10.15406/unoaj.2019.07.00247.
53. Parks JH, Goldfischer ER, Coe FL, et.al, 2003. Changes in urine volume accomplished by physicians treating nephrolithiasis. *J Urol.* 169(3), Pages 863–866. Doi: 10.1097/01.ju.0000044922.22478.32.

54. Kober A, Dobrovits M, Djavan B, et al, 2003. Local active warming: an effective treatment for pain, anxiety and nau-sea caused by renal colic. *J Urol.* 170(3), Pages 741–744. Doi: 10.1097/01.ju.0000080570.83834.ad.
55. Bhattacharya B, Sharma C, 2018. Potential bioactive properties of *Hibiscus sabdariffa* (Roselle). *World J PharmPharm Sci.* 7(10), Pages 718–734. Doi: 10.20959/wjpps201810-124420.
56. Ameer A A, Shakoori A, 2021. A review on the epidemiology, pathophysiology, and management of urinary stones. *Journal of Medical Sciences.* 21(2), Pages 163-169. Doi: 10.1016/S0140-6736(06)68071-9.
57. Khan S R, Glenton P A, 2017. Stone disease: A review of the literature. *Urological Research*, 45(1), Pages 23-29. Doi: 10.1155/2018/3068365.
58. Siener R, Hesse A, 2019. The role of dietary factors in the prevention and treatment of urolithiasis. *British Journal of Nutrition.* 122(3), Pages 260-272. Doi: 10.3390/nu13061917.
59. Jansen J E, Haring H, 2018. The role of herbal medicines in the management of urolithiasis: A review *Phytotherapy Research*, 32(10), Pages 1906-1918. Doi: 10.1615/JEnvironPatholToxicolOncol.2019029075
60. Zhang Y, Zhang M, 2020. Effectiveness of herbal medicine in treating urinary stones: A systematic review. *Journal of Herbal Medicine.* 20, Pages 100275. Doi: 10.4081/aiua.2016.1.38.