A Review on Herbal Medicine Acting on Kidney Stone

Mrs.Rajashri.V.Patil, Ms Shradha Phad ,Ms Diksha Randhir, Ms Pratiksha Rahane,
Mr.Yashodip.Pawar, Dr.Samiksha Warke
Assistant professor, Research students
Corresponding author address:-KYDSCT'S COP, Sakegaon, Bhusawal

Abstract:- Kidney stones are one of the oldest known and common diseases in the urinary tract system. Various human studies have suggested that diets with higher intake of vegetables and fruits play a role in prevention of kidney stones. In this review overview of kidney stone and their mean chemicals constituents ,type and treatment many of these stones are so small that they are able to travel to the bladder in just a few days or weeks without any treatment ,and then exit the body in your urine .If smaller stones are causing problem ,its often enogh take painkillers ,drink plenty of fluids, move enogh and simply wait for the kidney stones to pass through .Muscle relaxing medications can be used to help pass medium sized stones.

Keywords:- kidney stone ,uric acid , hypercalcium ,cysteine

INTRODUCTION:

Kidney stones, the formation of stones in the kidneys, is one of the oldest known and wide spread diseases in the urinary tract system with are lapserate of 50% in 5– 10 years. It is the third most common disorder among urinary diseases. It has been reported that 10–12% of people in industrialized countries (10% of men and 3% of women) have a urinary stone during their lives. The etiology of this disorder is multifactorial and is related to genetics, diet, and low activity. Calcium-containing stones are the most common kidney stones (75–90%), followed by magnesium ammonium phosphate (struvite) (10–15%), uric acid (3–10%), and cystine (0.5– 1%). The mechanisms related to the development of kidney stones are not completely understood. Generally, it is believed that urolithiasis, the process of stone formation in the urinary tract, causes crystal aggregation, nucleation, and growth of insoluble particles. The stones may cause various symptoms, including pain, obstruction, infection, and hemorrhage, through the passage of stones in the urinary tract system. Treatment and management of renal stones relies on surgical techniques, such as extracorporeal shock wave lithotripsy, percutaneous lithotripsy, and transurethral lithotripsy. These surgeries are complex and expensive and do not affect the recurrence of stones. Various medicines, including thiazide as diuretic and alkali-citrate, are applied to prevent the frequency of hypercalciuria and hyperoxaluria—which cause calculi formation—but they are not promising enough due to their limited effectiveness and low tolerability. Because of the disadvantages of surgical techniques and limited choice in pharmacotherapy, exploring new pharmacological therapies for the management of kidney stones is worthwhile. Various medicinal plants with diuretic, antispasmodic, and antioxidant activities exert inhibitory effects on crystallization, nucleation, and aggregation of crystals, making them useful for treatment of urolithiasis.The aim of the present article is to provide a critical review of the role of dietary plants as natural supplements in the prevention or management of kidney stones and elaborate underlying pharmacological mechanisms as well as their phytochemical constituents responsible for this activity.[1]

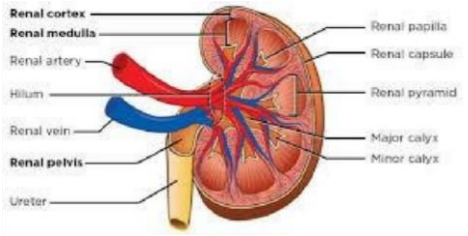

Fig.1 Transverse section of Kidney

The kidneys are a pair of bean- shaped organs located in the retroperitoneal space on either side of the spine, at the level of the last thoracic and first three lumbar vertebrae. They are essential organs in the urinary system and play a vital role in filtering blood, removing waste products, regulating electrolytes, and maintaining fluid and acid-base balance.

Anatomy of the Kidneys:
Renal Capsule: Each kidney is surrounded by a tough, fibrous layer called the renal capsule, which protects it from trauma and infection.

Renal Cortex: This is the outer region of the kidney, which contains the glomeruli, where blood filtration begins.

Renal Medulla: The inner region, containing the renal pyramids and loops of Henle, where urine concentration occurs.

Renal Pyramids and Papillae: The medulla consists of renal pyramids, which have a cone shape and drain urine into the renal papillae at the tips.

Physiology of the Kidneys:-

- Filtration: Blood enters the kidneys through the renal arteries and flows into the glomeruli, where filtration begins. The glomerular membrane allows water, ions, glucose, and small molecules to pass through, while larger molecules like proteins remain in the bloodstream.
- Reabsorption: In the renal tubules, useful substances like glucose, amino acids, and electrolytes are reabsorbed into the blood stream. Water reabsorptional so occurs here, regulated by hormones like ADH (antidiuretic hormone).
- Secretion: The tubules actively secrete waste products and excessions like potassium and hydrogen into the tubule fluid, which eventually forms urine

WHAT IS KIDNEY STONE:

A kidney stone is a hard object that is made from chemicals in the urine. There are four types of kidney stones: calcium oxalate, uric acid, struvite, and cystine. A kidney stone may be treated with shockwave lithotripsy, uteroscopy, percutaneous nephrolithomy or nephrolithotripsy.
Common symptoms include severe pain in lower back, blood in your urine, nausea, vomiting, fever and chills, or urine that smells bad or looks cloudy.

TYPE OF KIDNEY STONE:

1.Calcium stones:
Most kidney stones are calcium stones , combined with oxalate, phosphate, or occasionally uric acid. Calcium oxalate crystal formation is also one of the toxic effects of ethylene glycol poisoning. Oxalate is a naturally occurring substance found in food. Some fruits, vegetables, nuts and chocolate, have high oxalate levels. Liver also produces oxalate.
Dietary factors, high doses of vitamin D, intestinal by pass surgery and several metabolic disorders can increase the concentration of calcium or oxalate in urine. All calcium stones are radio-opaque, and calcium oxalate and calcium phosphate stones are black, grey, or white and small (1cm in diameter) dense and sharply circumscribed on radiographs.
Calcium oxalate stones appear as'envelopes' microscopically. The formation of calcium phosphate stones is associated with conditions such as hyper parathyroidism and renal

Fig. 2 Calcium stone

1.Uric acid stones: Uric acid stones are smooth, round, yellow-orange and nearly radiographically transparent. About 5–10% of all stones are formed from uric acid. Uric acid stones can form in people who don't drink enough fluids or who lose too much fluid, those who eata high-protein diet, diets high in purines, especially those containing meats and fish and those who have gout certain metabolic abnormalities; including obesity or certain genetic factors also may increase your risk of uric acid stones. These patients also have a tendency to form urate stones. Urate stones are especially common after colon resection. Uric acid stones appear as pleomorphic crystals, usually diamond-shaped, squares or rods which are polarizable.

Fig 3.Uric acid stones

1.Struvite or infection or triple phosphate stones:
Struvite is a crystalline substance composed of magnesium ammonium phosphate. About 10–15% of urinary calculi are composed of struvite. Struvite stones form most often in the presence of infection by urea-splitting bacteria. Using the enzyme urease, these organisms metabolize urea into ammonia and carbon dioxide. This alkalinizes the urine, resulting in

favorable conditions for the formation of struvite stones. Signs of struvite stones include urinary pH greater than 7, staghorncalculi,and urease that grow bacteria on culture(proteus,klebsiella, pseudomonas).

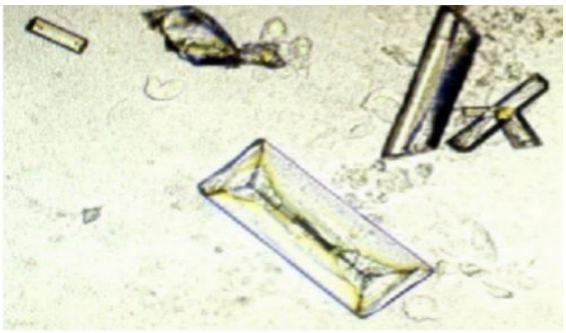

Fig.4:Triplephosphatestones

2.Protease-related stones:

This is the newest type of stones.The increasing incidence of HIV-positive patients has led to wide spread use of the protease inhibitor indinavir sulphate. In 4-12% of patients this drug, may leads to formation of stones.

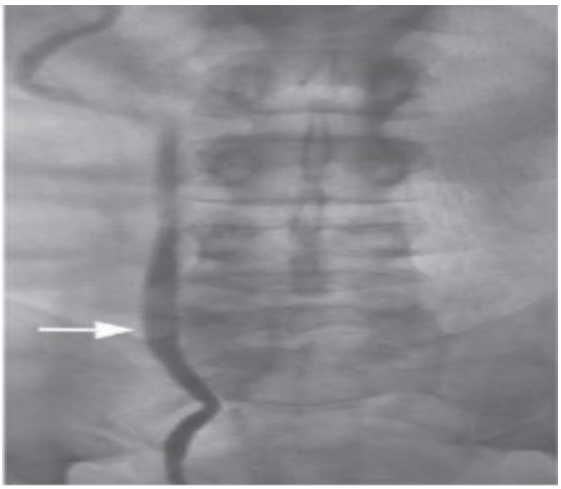

Fig.5:Protease-related stone

1.Cystine stones:

These stones are rare and formin people with a hereditary disorder that causes the kidneys to excrete too much of certain amino acids (cystinuria). People who are homozygous for cystinuria excrete more than 600mg per day of insoluble cystine.The stones are greenish- yellow, flecked with shiny crystallites, and are moderately radio- opaque with a rounded appearance.

Fig.6: Cystine stones

2.Silicate stones or drug induced stones:

These are stones are found very rarely. These stones can form as a result of taking certain medications or herbal products like loop diuretics, acetazolamide, topiramate, zonisamide, laxatives (when abused), ciprofloxacin, sulfa medications, triamterene, indinavir, ephedrine, guaifenesin, and products containing silica. [3]

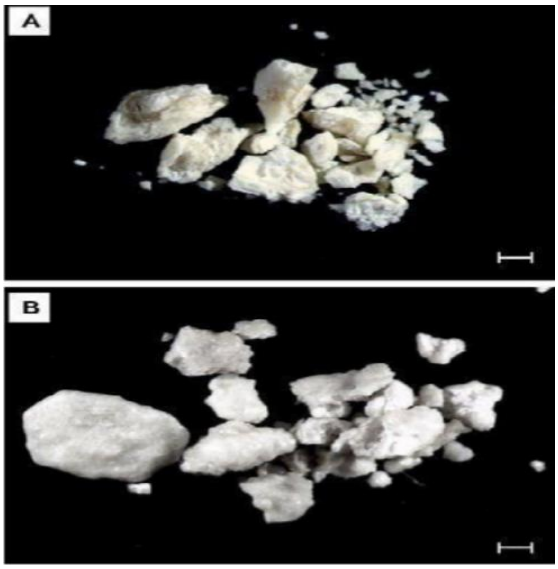

Fig.7:Silicate stones

TREATMENT OF KIDNEY STONE:

Herbs and herbal medications are helpful in the treatment of kidney stones.These medications have sparked attention among people because of their clinically validated benefits, such as immunomodulation, adaptogen, and antimutagenic properties. Due to the abuse of synthetic pharmaceuticals and increased frequency of bad drug reactions,people are compelled to revert to using natural therapies. Many therapy alternatives have been established in recent years for urinary stone diseases. Many of these therapies require surgery, are quite expensive, and are frequently unavailable.Because of this,most peoples elector can only access traditional

herbal treatments for urinary stones, such as Ayurveda. [4]

Ultrasound shock wave therapy :

In ultrasound shock wave therapy, sound waves are used to break up the stones. The stone fragments are then flushed away in the urine. This treatment is also referred to as extracorporeal shockwave lithotripsy(ESWL).A machine is used to send sound waves from outside of the body through the tissue to the stones. Shock wave therapy typically takes about 30 to 60 minutes when treating simple kidney stones (without complications). It can often be done without having to spend the night in hospital.The treatment outcome can be checked using ultrasound or x-ray scans. Shock wave therapy is especially suitable for kidney stones that are smaller than 20 millimeters in diameter. If the stones are in the upper third of the ureter,they shouldn't be any bigger than 10 millimeters, though.[5]

Drawback:
On the down side SWL can cause vascular trauma to the kidney and surrounding organs.This acute SW damage can be severe, can lead to scarring with a permanent loss of functional renal volume, and has been linked to potentially serious long-term adverse effects.

Limitations:

Tissue Damage: High-intensity shock waves can cause tissue damage,limiting their use in certain medical applications.

Depth Penetration: Limited penetration in deep tissues may restrict the effectiveness of shock waves for treating internal conditions.

Pain During Treatment: Patients may experience discomfort or pain during shock wave therapy, impacting its tolerability.

Risk of Complications: There's apotential risk of complications,such as bruising or hematoma formation, associated with shock wave treatments.[6]

Ureterorenoscopy(URS):

In this method,tiny instruments are moved through the urethra (the passage way that urine flows out of) and bladder with the help of an endoscope, and pushed up into the ureter. There the stone is either broken up mechanically or using a laser so that the pieces can be flushed out in the urine or removed using the endoscope. URS is used for stones that are bigger than 10 millimeters in diameter and are in the middle or lower third of the ureter.Kidney stones upto 20 millimeters in diameter are often removed using URS.[7]

Drawback:

Although this in vasive procedure does not pose any threat if done properly. But in certain cases, it may cause infection,bleeding and injury to the ureter.There is ableakrisk (onein1000)of a major injury that could require an extensive surgery to repair.In case of placement of stent,there might be a little pain and discomfort while urinating for a few days until it is removed.

Limitations:

Ureterorenoscopy, a procedure involving the use of a thin tube to examine and treat issues in the ureter and kidney,has certain limitations.One key limitation is the potential difficulty in accessing certain locations within the urinary tract,especially if there are anatomical variations or obstructions.[8]

Percutaneous Nephrolithotripsy (PCNL):

In this method,an endoscope is moved into the renal pelvis or the kidney through a small cut made on your back. There the stones can also be either broken up mechanically or with a laser. Tiny forceps are used to remove the pieces of the kidney stones. This method is mainly used to treat kidney stones greater than 10 millimeters in diameter.

Drawback:

There is a possibility that the stone(s) may not be able to be removed completely,usually either due to the size or location of the stone(s). Additional treatment may be required.

MEDICINAL PLANTS FOR TREATMENTS OF KIDNEY STONE

Name	Family	Plant partsused	Therapeutic effect
1)*Ocimumsanctum* (Tulsi)	Lamiaceae	Leaf and stem	Kidney stone

2)*Punicagranatum* (Pomogranate)	Punicaceae	Fruits	Kidney stone
3)*Terminaliaarjuna* (ArjunTree)	Combretaceae	Stembark	Kidney stone
4)*Chebulicmyrobalan* (Alalemara)	Combretaceae	Stembark	Kidney stone
5)*Zingiberofficinale* (Ginger)	Zingiberaceae	Rhizome	Kidney stone
6)*Citruslimon* (Lemon)	Rutaceae	Fruits	Kidney stone
7)*Citrussinensis* (Orange)	Rutaceae	Fruits	Kidney stone
8)*Solanumlycopersicum* (Tomato)	Solanaceae	Fruits	Kidney stone
9)*Tectonagrandis* (Teak)	Verbenaceae	Stembark	Kidney stone
10)*Mangiferaindica* (Mango)	Anacardiaceae	Fruits	Kidney stone

SYNTHETIC DRUG:

Synthetic drugs(or new psychoactive substances(NPS), aim to mimic the effects of existing illicit drugs (such as cannabis, cocaine, MDMA and LSD).

Synthetic drugs have different chemicalstructuresfromthe illicit substances theyare trying to mimic. Manufacturers of synthetic drugs constantly change their chemical structures to try and stay ahead of the law.

Some synthetic drugs can be marketed as'legal',safe and acceptable alternatives to illicit drugs. However, this does not mean that they are legal or safe.

There is no recommended dosageon a packet of synthetic drugs. The chemicals can also change from one packet to the next. Two packets from the same batch can affect you in different ways. Synthetic drugs are not quality controlled or regulated,so there are concern sover what is actually in them.

Synthetic drugs commonly used for the treatment of kidney stones include:

Alpha-blockers (e.g.,tamsulosin,terazosin):These medications help to relax the muscles in the ureter, facilitating the passing of kidney stones.

Calcium channel blockers(e.g.,nifedipine):Sometimesusedtorelaxthem usclesinthe ureter, aiding in the passage of kidney stones.

Nonsteroidal anti-inflammatory drugs(NSAIDs) (e.g.,ibuprofen, naproxen):Maybe prescribed to relieve pain associated with kidney stones and reduce inflammation.

Corticosteroids (e.g.,prednisone): In some cases,corticosteroids are used to reduce inflammation and pain caused by kidney stones.

Phosphodiesterase inhibitors (e.g., tadalafil, sildenafil): These medications may help to relax muscle cells in the urinary tract, potentially assisting with the passing of kidney stones.[13]

Advantages of synthetic drugs:

Effectiveness: Synthetic drugs can be effective in relieving symptoms associated with kidney stones, such as pain and inflammation.

Speed: Some synthetic drugs, such as alpha-blockers, can help relax the muscles in the ureter, facilitating the passage of kidney stones and potentially speeding up the recovery process.

Pain relief: Nonsteroidal anti-inflammatory drugs (NSAIDs) and corticosteroids can provide pain relief and reduce inflammation associated with kidney stones.

Non-invasive :The use of synthetic drugs is usually non-invasive and can be a preferred option for patients who prefer to avoid surgical procedures. [14]

Disadvantages of synthetic drugs:

Side effects: Synthetic drugs can have side effects,such as dizziness, headaches, gastrointestinal issues, and allergic reactions.

Limited effectiveness : Some synthetic drugs may not be effective for all types of kidney stones, and their effectiveness can vary from person to person.

Potential interactions: Synthetic drugs may interact with other medications that the patient is taking,

leading to potential complications or reduced efficacy.
Cost:The cost of synthetic drugs can be a disadvantage for some patients, especially if they are not covered by insurance.

HERBAL FORMULATION

SR NO	PRODUCTNAME	INGREDIENTS	COMPANY	REFERENCE NO
1	Patharchatadi (Stone Cracker)  Fig.8	Pashanbhed Varunchhal, AmalaGokharu,Brahmi Beheda, AdulsaVasalca Kutki,Chirayata,Neem, Glloy	Krishna's Herbal &Ayurveda (Jodhpur Rajasthan)	15
2	Punarnava(UrinaryWellness)  Fig.9	Punarnava (*Boerhaavia diffusa*) root extract	HimalayalSince 1930 Dehradun	16

SR NO	PRODUCTNAME	INGREDIENTS	COMPANY	REFERENCE NO
3	 Fig.9	Punarnava(*Boenhaavia diffusa*), Gokhru (*Tribulus,terrestris*), Varuna(*Creataeva nurvala*)	Globuls Natural (NewDelhi)	17
4	KidneyStoneCrusher  Fig.10	Pattachara juice Stone Crusher Juice,Gokru Bee Ajwini	Farm Naturelle (Nainital Uttarakhand)	18

SR NO	PRODUCTNAME	INGREDIENTS	COMPANY	REFERENCE NO
5	Liver-kidneyCare  Fig.11	Greentea,Turmeric,Ginger, Milk Thistle,Black Radish, Pudina, Lactose, Beet, Drumstick	OrganicIndia (Lucknow)	19
6	Kidney Detox Tea  Fig.12	Organic whole leaf green tea, Dandelion,Kalmegh Tulsi, Manjistha, Turmeric Kasni, Bilwa Patra glloy, Amla powder, Ginger, Kutki, Nettle Leaf and many such	Tifusion House of Government Teas Ltd. (Kolkata)	20
7	KidneyStonessupport  Fig.13	Pashanbhed (Root)Palasha (Flower), Punarnava (Root), Kultha,Shakkerteti,Gokshur (Fruit)	Green Cross Remedie, Siddhpur,Gujarat	21
8	Stonyl Tablet  Fig.14	Daruhaldi Kalipat Dhania Shatavari Akarkara Javkhar Shilajit Kalmishora Tankankhar Pashanbheda Dhamasa	Himmatnagar Gujarat, India.	22
9	 Fig.15	Gokhru, Kulath, Punarnava, Shuddha Shilajit, Mountain Knot Grass, Guduchi, and Ajwain oil.	Elements Wellness Private Limited, 30 April, 2013, Chennai, Tamil Nadu.	23

10		Punarnava-Boerrhavia diffusa Varun-Crataeva nirvala Gokshura-Tribulusterres tris Palash-Butea monosperma Kasni-Cichorium intybus	Planet Ayurveda Bhandup West (Mumbai) (MAHARASHTRA)	24
11	Himalaya Cystone  Fig.17	Pashanabheda (Saxifraga Ligulata),Small Caltrops (Gokshura) and Shilapushpa (Didymocarpus Pedicellata),	Himalaya Herbal Healthcare	29
12	Renstone  Fig.18	Shigrumul(moringa deitera). Shigrumul (butus ferrestis)(moringadei fera) Gokshur(Tribulus terrestis) Ushir(Andropogon Vetiveria)kantakari(Solanum Xanthocorpum) pashanbhed(Bergenia Ligulata) Varun(CrataveaNuryala) Kullath (Dolichos biflorus)	Unisage, Ludhiana, Punjab.	30
13	Himalaya Cystone  Fig.19	Pashanabheda (Saxifraga Ligulata),Small Caltrops (Gokshura) and Shilapushpa (Didymocarpus Pedicellata),	Himalaya Herbal Healthcare	29
14	Renstone  Fig.22	Shigrumul(moringa deitera). Shigrumul (butus ferrestis)(moringadei fera) Gokshur(Tribulus terrestis) Ushir(Andropogon Vetiveria)kantakari(Solanum Xanthocorpum) pashanbhed(Bergenia Ligulata) Varun(CrataveaNuryala) Kullath (Dolichos biflorus)	Unisage, Ludhiana, Punjab.	30

15	Himalaya Cystone  Fig.21	Pashanabheda (Saxifraga Ligulata),Small Caltrops (Gokshura) and Shilapushpa (Didymocarpus Pedicellata),	Himalaya Herbal Healthcare	29
16	Renstone  Fig.20	Shigrumul(moringa deitera). Shigrumul (butus ferrestis)(moringadei fera) Gokshur(Tribulus terrestis) Ushir(Andropogon Vetiveria)kantakari(So lanum Xanthocorpum) pashanbhed(Bergenia Ligulata) Varun(CrataveaNuryala) Kullath (Dolichos biflorus)	Unisage, Ludhiana, Punjab.	30

CONCLUSION

As mentioned, globally kidney stones are one of the most important problems which affects the urinary system. There are many therapeutic options across different practices of medicine which we can use to treat these renal stones. Most of them are highly expensive that people could not afford. Most of the patient focus has seen a shift towards herbal medicine due to unfavorable effects of otheroptions. But there is also a need to develop awareness among people about using herbal medicine. By proving its efficacy in treating numerous ailments, it is necessary to foster faith and trust in the safer indigenous system. Because the cost of the contemporary medical systemwillrisesteadily,we must integrate herbal medicine at the highest level into our health care system.With the advantages of greater safety and cheaper cost,we expect that in the future,natural and herbal medicinal systems will compete with modern medicinal systems and as supportive therapy to prevent the further progress & decrease the prevalence of disease even though the surgical intervention may be required in already formed and non-treatable renal stones.[33]

REFERENCES

[1] UribarriJ,OhMS,CarrollHJ.Thefirstkidneyston e.AnnInternMed1989;111:1006–9.

[2] Khan, F., Haider, M. F., Singh, M. K., Sharma, P., Kumar, T., & Neda, E. N. A comprehensive review on kidney stones,its diagnosis and treatment with all opathic and ayurvedic medicines.Urol Nephrol Open Access J, 2019; 7(4), 69-74.

[3] Callaghan D,Bandyopadhyay BC.Calcium phosphate kidney stone:problems and perspectives.J Physiol. 2012;6(8):118–125.

[4] Gauri DD, Sanjay BB (2020) Traditional medicinal plants used in treatment of urolithiasis:In Maharashtra region:Areview.Bulletin of Environment, Pharmacology and LifeSciences.9(4):159- 170.

[5] Osther,P.J.,&Razvi,H.(2011).Extracorporeal shockwave lithotripsy:Complications and their prevention. In Complications of Urologic Surgery (4th ed., pp. 439-448). Saunders.

[6] Aboumarzouk OM,HasanR,TasleemA,MariappanM,HuttonR, FitzpatrickJet al.

[7] Butterweck V,Khan SR. Herbal medicines in the management of urolithiasis:Alternative or

Complementary? Herbal Med Planta Med 2009; 75, 1095-1103.

[8] Dush B,KashyapL(1979)Herbal plants in kidney stone.In:Materia medica of Ayurveda.New Delhi: Concept Publishing Co. 89.

[9] Prachi N,Chauhan D,Kumar MS.Medicinal plants of Muzaffarnagar district used in treatmentof urinary tract and kidney stone. Indian J Traditional Knowledge 2009; 8(2): 191-195.

[10] Karimi M,Naghdi N,Naji-HaddadiS,BahmaniF(2017)Medicinal plants used for kidney pain. Journal of Pharmaceutical Sciences and Research. 9(5):542-546.

[11] Sewell RDE,Rafieian-KopaeiM.The history and ups and Downs of herbal medicine usage. J Herbmed Pharmacol 2014; 3:1-3.

[12] Evan AP,Coe FL,Lingeman JE,Worcester E. Prevention and treatment of kidney stone Urological research 2005; 240(5): 488-500.

[13] National Endocrine and Metabolic Diseases Information Service"Hyperparathyroidism (NIH Publication No. 2006; 6–3425)".

[14] KhanS.R.,CanalesB.K.,Dominguez-Gutierrez P.R.Randall's plaque and calcium oxalate stone formation: role for immunity and inflammation. Nat. Rev. Nephrol. 2021;17(6):417–433.

[15] Agnivesh Charak Samhita edited by Acharya Vidyadhara Shukla and Ravidatta tripathi Chaukhamba Sanskrit pratishthan, Delhi, Chikitsa Sthan, 630: 26-36.

[16] Anathramsharma.Sushrutsamhita vol II.Varanasi,Chaukhambha Sanskrit sansthan2012 (nidan sthan- 23th chapter slok no-68). P-485.

[17] Pentoxifylline for Renal Protection in Diabetic Kidney Disease.A Model of Old Drugs for New Horizons J Clin. Med., 8 (2019), p. 287,

[18] Shanmugasundaram P, Venkataraman S. Anti-nociceptive activity of Hygrophila auriculata (Schum) Heine. The African Journal of Traditional, Complementary and Alternative Medicines. 2005;2: p. 62.

[19] Coresh J., Selvin E., Stevens L.A., Manzi J., Kusek J.W., Eggers P., Van Lente F., Levey A.S. Prevalence of chronic kidney disease in the United States. Jama. 2007;29