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NOVEL DRUG REMEDY FOR KIDNEY STONE DISSOLUTION: AN COMPLETE STUDY

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ABSTRACT

Nephrolithiasis (kidney stone) is one of the oldest known & common illnesses in the urinary tract system. Most of the people generally can have renal stones at any phases of life. Commonly high in males as well as in females. Urinary stones can be severely painful and make a huge economic burden. Common type of kidney stone is calcium oxalate uric acid, urinary stones . Struvites and cysteine affect 10-12% of the population in industrialized countries After the data collected from in vivo, in vitro + clinical trials Suggest the herbal medicinal plant could be used as used as an alternative. We used poly herbal elixir for the kidney stone dissolution in this research innovation.

KEYWORDS: *kidney stone, calcium oxalate. UV spectroscopy. The Thin layer chromatography, Maceration, percolation alc extract, Herbal Mixers, Elixir.*

INTRODUCTION

What is a renal calculi ?

A kidney stone is a solid piece of material that forms in a kidney when substances that are normally found in the urine become highly concentrated. A stone may stay in the kidney or travel down the urinary tract. Kidney stones vary in size. A small stone may pass on its own, causing little or no pain. A larger stone may get stuck along the urinary tract and can block the flow of urine, causing severe pain or bleeding Kidney stones are one of the most common disorders of the urinary tract. Each year in the United States, people make more than a million visits to health care providers and more than 300,000 people go to emergency rooms for kidney stone problems.[1]Urolithiasis is the medical term used to describe stones occurring in the urinary tract. Other frequently used terms are urinary tract stone disease and nephrolithiasis. Terms that describe the location of the stone in the urinary tract are sometimes used. For example, a ureteral stone—or ureterolithiasis—is a kidney stone found in the ureter

What is the urinary tract?

The urinary tract is the body's drainage system for removing wastes and extra water. The urinary tract includes two kidneys, two ureters, a bladder, and a urethra. The kidneys are two bean-shaped organs, each about the size of a fist. They are located near the middle of the back, just below the rib cage, one on each side of the spine.

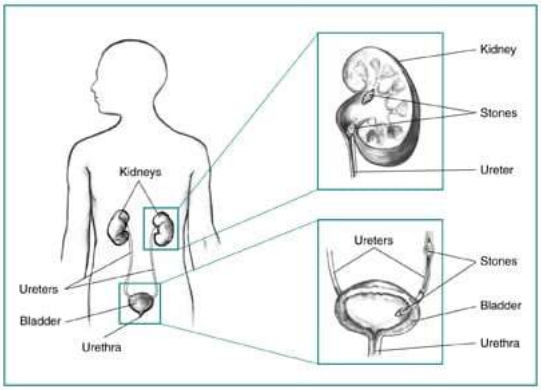

Fig.1. Drawing of the urinary tract with kidney stones.

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Who Gets Renal Calculi

Kidney stones can affect anyone, but they tend to be more common in men, especially among non-Hispanic white individuals. Overweight and obese people are also at a higher risk compared to those with normal weight. In the United States, about 8.8% of the population, or one in 11 people, has experienced a kidney stone.[2]

- **Ingredients**

Siam garden panfuti
Gokharu
Orange peel
Ethanol
Water

- **Equipment**

Stoppered container
Mortal pestle
Measuring cylinder
UV spectroscopy
Centrifuge
Spatula
Percolator
Maceration apparatus

- **Types of Kidney Stones**

Four major types of kidney stones can form:

Calcium Stones

These are the most common and come in two forms, calcium oxalate and calcium phosphate. High excretion of calcium and oxalate can lead to calcium oxalate stones, while calcium phosphate stones are caused by a combination of high urine calcium and alkaline urine[3]

Uric Acid Stones

These form when urine is consistently acidic. A diet rich in purines, found in animal proteins like meats, fish, and shellfish, can increase uric acid in urine, leading to stone formation[4]

Struvite Stones

Resulting from kidney infections, preventing further infections and removing infected stones can help avoid more Struvite stones.

Cysteine Stones

Caused by a genetic disorder that allows cysteine to leak into urine, forming crystals that tend to accumulate into stones.

- **Composition of Kidney Stones**

The majority of kidney stones, around 80%, are calcium stones, with half being calcium oxalate (CaOx), 5% calcium phosphate (CaP), and 45% a mix of both. Calcium oxalate exists in forms like CaOx monohydrate (COM) and CaOx dehydrate (COD). Struvite stones, accounting for 10-15%, result from chronic urinary tract infections producing urease. Urease splits urea to ammonia, making urine alkaline, leading to phosphate precipitation and large staghorn stone formation. Uric acid stones (3-10%) relate to high purine diets, especially from animal proteins, and are more common in men, often associated with gout. Cysteine stones, less than 2%, stem from a genetic disorder causing excess cystinuria, leading to insoluble cysteine accumulation and stone formation.

- **History of Kidney Stones**

People have known about kidney stones for thousands of years. In Joseph Glanville's Saducismus Triumphatus, there's a detailed account of Abraham Mechelburg passing small stones through his penis, and it's attributed to witchcraft.

Ancient medical texts from Mesopotamia, India, China, Persia, Greece, and Rome discussed kidney stones. The Hippocratic Oath implies the presence of ancient Greek surgeons skilled in lithotomies (surgical removal of stones). Aulus Cornelius Celsus's De Medicine, a Roman medical treatise, detailed lithotomy[6], influencing the procedure until the 18th century.[7]

Several historical figures, including Napoleon I, Epicurus, Napoleon III, Peter the Great, Louis XIV, George IV, Oliver Cromwell, Lyndon B. Johnson, Benjamin Franklin, Michel de Montaigne, Francis Bacon, Isaac Newton, Samuel Pepys, William Harvey, Herman Boerhaave, and Antonio Scarp, experienced kidney stone disease.[8]

From 1520 onwards, new methods in lithotomy started emerging, but the procedure remained risky. The introduction of litholapaxy by Henry Jacob Bigelow in 1878[9] significantly reduced the mortality rate from about 24% to 2.4%. Despite this improvement,

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other treatment techniques continued to carry a high risk of mortality, especially when performed by inexperienced urologists[10,11]. In 1980, Dornier MedTech introduced extracorporeal shock wave lithotripsy, a technique using acoustical pulses to break up stones, and it has become widely adopted since then.[12]

- **Pathophysiology of Kidney Stones:**

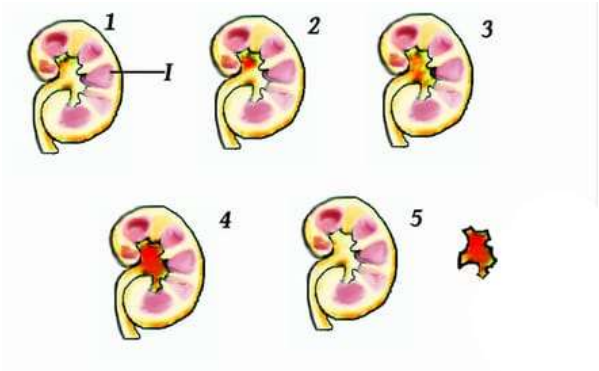

Figure.2.

Pathophysiology

Tiny crystals, often made of calcium oxalate and typically measuring 4–5 mm, form in the kidney. The process begins with the combination of calcium and oxalate to create the crystal nucleus due to super saturation. Continuous deposition at the renal papillae causes the kidney stones to grow. As they enlarge, they accumulate debris. If the stones block all paths to the renal papillae, it can lead to intense discomfort and pain. Complete staghorn stones can form, causing retention. Smaller particles breaking off may get stuck in urinary glands, causing discomfort. Displaced stones travel through the ureter, and if they can't be broken down, surgical removal becomes necessary.

Supersaturation of Urine

When urine becomes oversaturated with certain substances that form crystals, a seed crystal may develop through nucleation. Heterogeneous nucleation[13], occurring on a solid surface, is faster than homogeneous nucleation in a liquid medium. This is because it requires less energy. The seed crystal adheres to cells on a renal papilla's surface, growing and aggregating into an organized mass. The stone-forming process may accelerate if the urine pH is exceptionally high or low[14,15], depending on the crystal's chemical composition.

The level of urine super saturation concerning stone-forming compounds is influenced by pH. For instance, at a pH of 7.0, the solubility of uric acid in urine is 158 mg/100 mL. Lowering the pH to 5.0 decreases uric acid solubility to less than 8 mg/100 mL. Uric-acid stone formation requires both high urine uric-acid levels[16] (hyperuricosuria) and low urine pH; high uric-acid levels alone won't lead to stone formation if urine pH is alkaline. While super saturation is a necessary condition for urinary calculus development, it's not sufficient. Uric acid and cystine stones are likely caused by super saturation, but calcium-based stones, especially calcium oxalate stones, may have a more complex origin[17].

- **Preparation of Extract**

About 50g of fresh leaves were soaked separately in ethanol and water:Ethanol (3:7) in a stopper container for 3 days (maceration) with frequent agitation. The solutions were filtered to obtain alcoholic extract (AlcE) and hydro-alcoholic extract (HAlcE), respectively. The extracts were dried in a rotary evaporator and stored in desiccators for further use.

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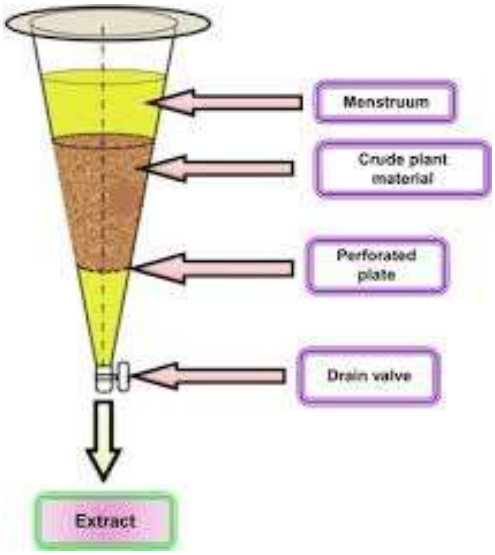

Fig.3.Maceration

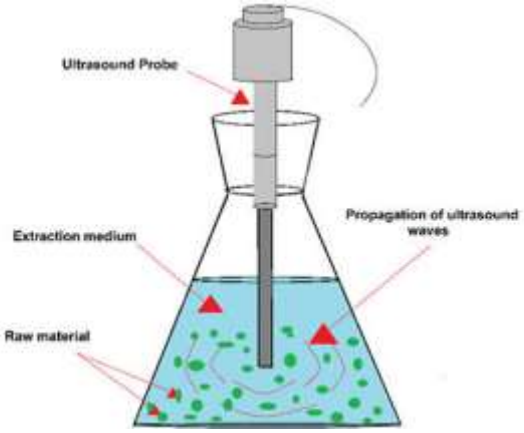

Fig.4.Percolation

- **Chemical constituents present in herbal plant**

1)Siam garden panfuti:- Bryophyllum pinnata is a perennial herb that is commonly used in folk medicine and Ayurveda to treat a variety of ailments, including the breaking and removal of kidney stones. An aberrant rise in urine calcium, oxalate, and uric acid, which lowers urinary citrate levels, is thought to be the origin of stone formation.

Triterpenes, steroid, phenanthrene, flavonoid, flavones, chalcones, taraxasterol, aurones, phenolic acid, caffeic acid, syringic acid, malic, oxalic and ferulic acid.

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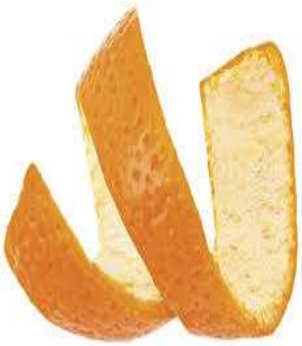
2) Gokharu

Fruit: Alkaloids 3.5%–5%, stable oil, aromatic oil, resins, glycosides, carbohydrates, saponins and triterpenoids.

3) Orange peel



cellulose, followed by lignin and then hemicellulose. Citric acid

- **Causes of Kidney Stones**

The general causes of kidney stones are as follows:

- ✓ Drinking too little water
- ✓ Eating animal protein or food that is high in sodium
- ✓ A calcium deficit diet increases the level of other substances that causes kidney stones
- ✓ Certain medications like diuretics and calcium-based antacids
- ✓ People with hypercalciuria are likely to develop kidney stones1
- ✓ Health conditions like
- ✓ Obesity
- ✓ Inflammatory bowel disease
- ✓ Hyperparathyroidism

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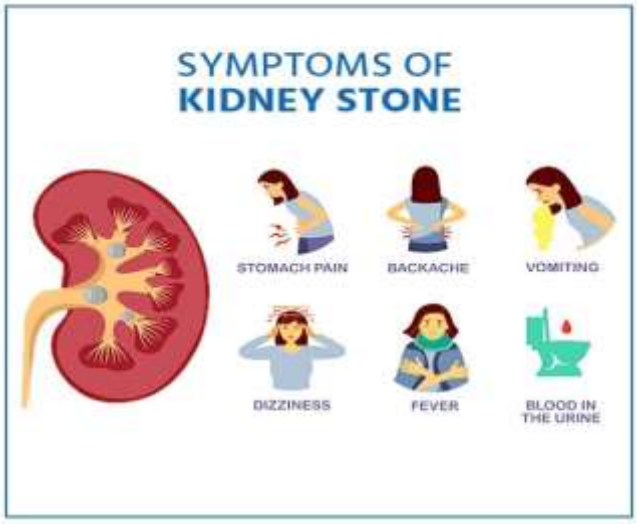
- **Symptoms**
- **How to avoid kidney stones**



Treatment of Kidney Stones

Shock Wave Lithotripsy

A machine called a lithotripter is used to crush the kidney stone. The procedure is performed by a urologist on an outpatient basis and anesthesia is used. In shock wave lithotripsy, the person lies on a table or, less commonly, in a tub of water above the lithotripter. The lithotripter generates shock waves that pass through the person's body to break the kidney stone into smaller pieces to pass more readily through the urinary tract.

Ureteroscopy

A ureteroscopy- a long, tubelike instrument with an eyepiece—is used to find and retrieve the stone with a small basket or to break the stone up with laser energy. The procedure is performed by a urologist in a hospital with anesthesia. The urologist inserts the ureteroscope into the person's urethra and slides the scope through the bladder and into the ureter. The urologist removes the stone or, if the stone is large, uses a flexible fiber attached to a laser generator to break the stone into smaller pieces that can pass out of the body in the urine. The person usually goes home the same day.

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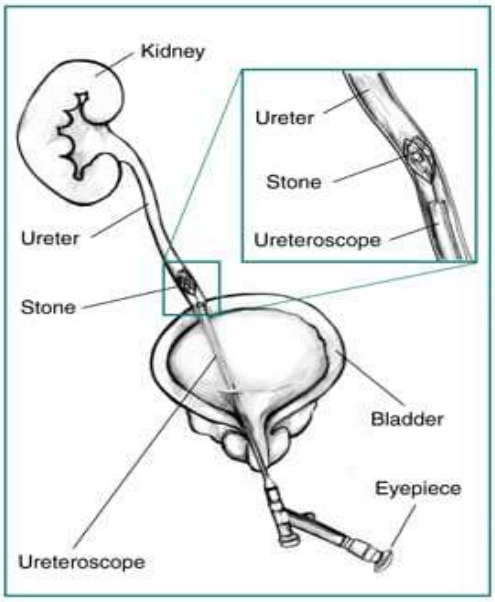

Fig. Ureteroscopy.

Percutaneous Nephrolithotomy

In this procedure, a thin viewing instrument called a nephroscope is utilized to locate and extract the kidney stone. A urologist performs this in a hospital under anesthesia. A tube is inserted directly into the kidney through a small incision in the person's back during the procedure. For larger stones, an ultrasonic probe acting as a lithotripter may be necessary, delivering shock waves to break the stone into smaller, more easily removable pieces. Following the procedure, the individual may need to stay in the hospital for several days, possibly with a nephrostomy tube inserted through the skin into the kidney. This tube drains urine and any remaining stone fragments into a collection bag, typically left in place for 2 or 3 days while the person remains hospitalized.

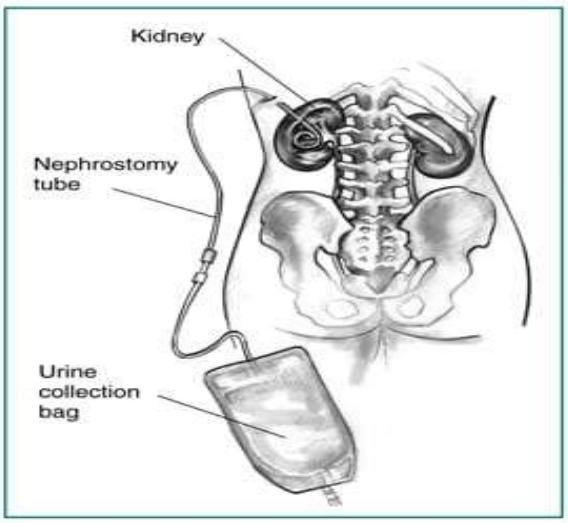

Fig. Percutaneous nephrolithotomy.

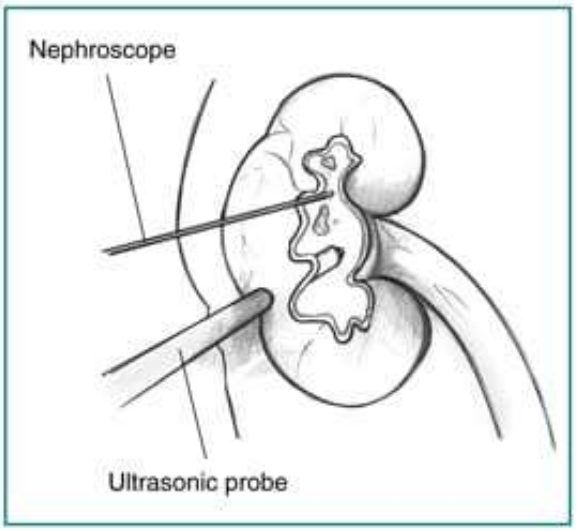

Fig. Nephrosotomy tube

- **Performing in-vitro study of polyherbal elixir**
  - **UV spectroscopy**

We perform the uv spectroscopy study on our herbal elixir in this study we check the screening of phytoconstituents present in the elixir in this study we check the screening of polyherbal elixir with compared to the each ingredient such as Siam garden panfuti extract. Gokharu extract. Orange peel extract in this study we check the screening of phytoconstituents between the ratio wavelength is 400 to 700nm

In this experiment we conclude the screening of phytoconstituents all essential constituent are present in the elixir.

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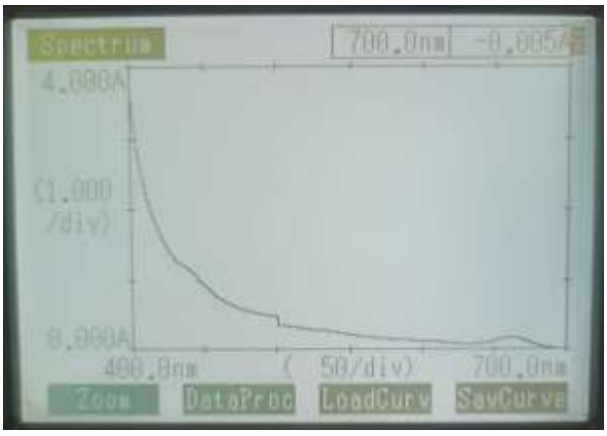
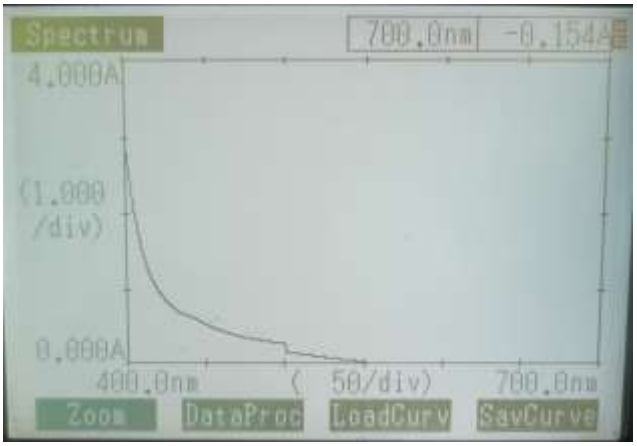
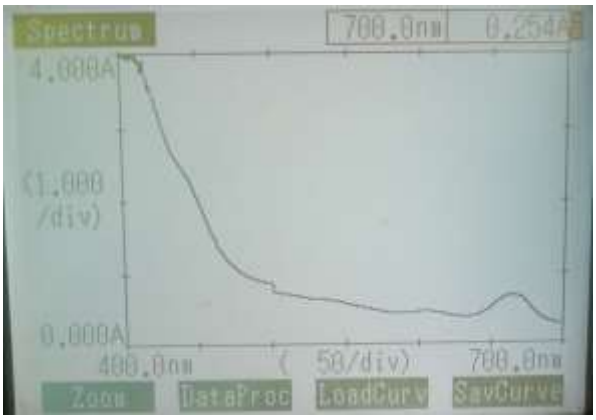
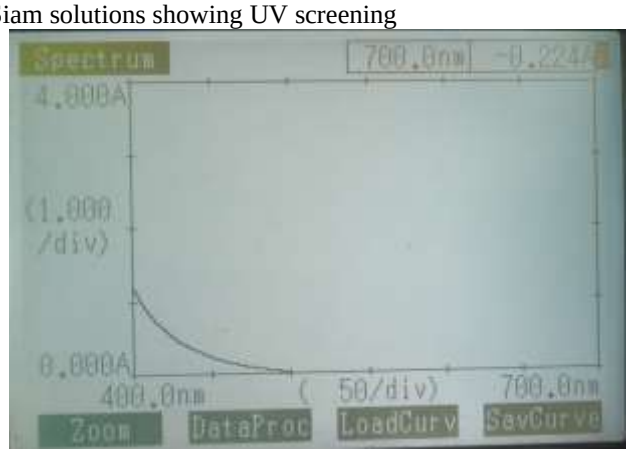


Polyherbal solutions showing UV screening spectroscopy.



Siam solutions showing UV screening





Orange solution showing UV screening spectroscopy, Gokharu solution showing UV screening

- **Thin Layer Chromatography**

We perform the thin layer chromatography in the laboratory
In the tlc the stationary phase is already present in the tlc plate Mobile phase is a alcohol Using tlc plate we determine the purity of the herbal elixir

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Polyherbal solutions showing TLC

- **Advantages of Polyherbal Elixir**

✓ Insoluble drug compounds can be incorporated into the hydroalcoholic vehicle;
✓ Drug concentrates can be prepared in high-alcohol-containing elixirs
✓ Hydroalcoholic vehicles can be self-preserving:
✓ Elixirs are less viscous and contain a lower proportion of sugar.
✓ Convenient dosing: The patient receives the usual adult dose of the drug in quantities of 5-10 ml rather than large quantities required for aqueous solutions of the same medicinal agent.

- **Result:**

Evaluationary test

Test Type	Parameters	Evaluationary Test
Physical test	Color Odour Taste	Clear transparent Characteristics Pleasant taste
Chemical test	PH Alcoholic content	6.0-7.0 slightly acidic PH 1% of the monograph
Physiological test	Bioavailability Absorption	Easily absorbed Efficiently absorbed

The kidney stones taken from different patients was found to be dissolved in polyherbal solutions by use of In Vitro methodology under normal conditions.

CONCLUSION

Thus use of polyherbal elixir under in-vitro study had an successful impact in condition of kidney stones.

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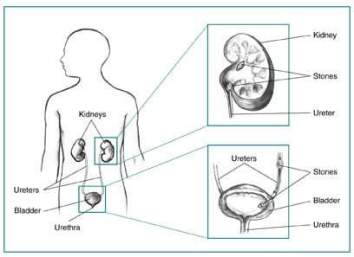
FIGURES

Fig 1.



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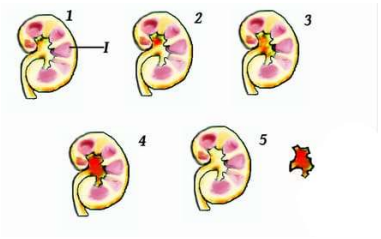

Fig 3

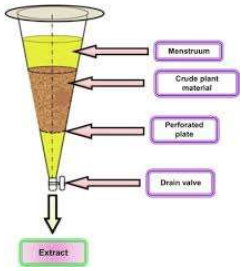

Fig 4

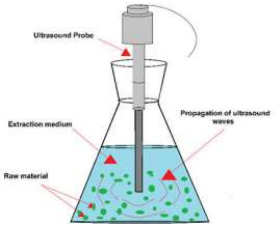

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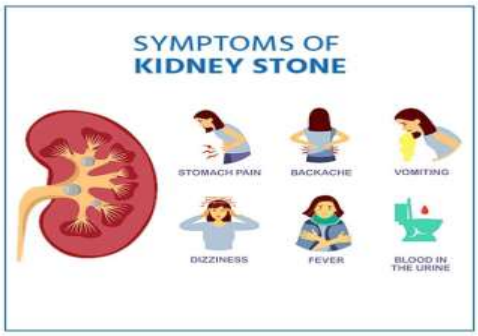
Fig 6

fig 7



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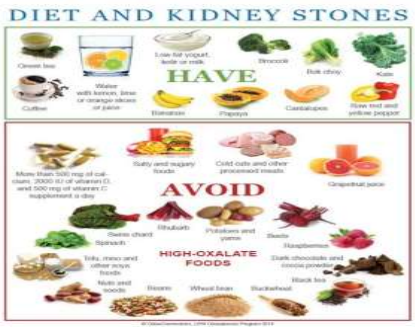
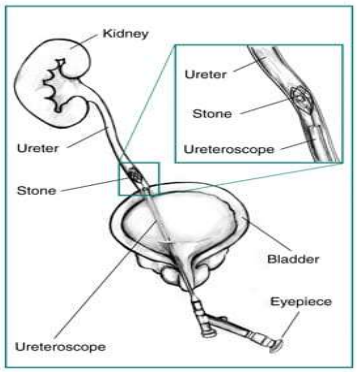


Fig 9



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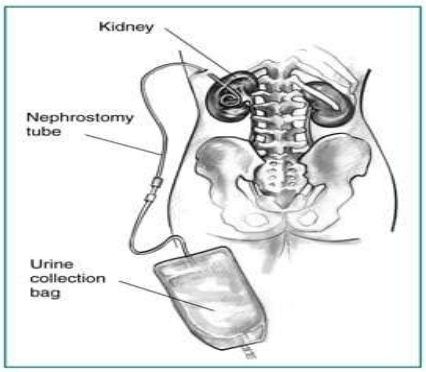

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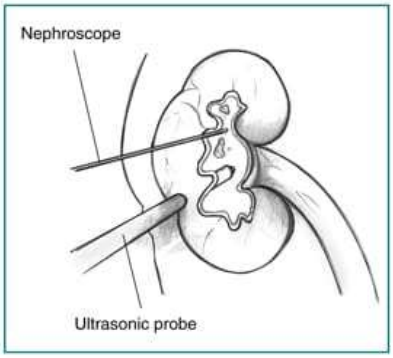

Fig 12

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