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UROLITHIASIS: PATHOPHYSIOLOGY AND BASIC PRINCIPLES OF MANAGEMENT

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ABSTRACT

The purpose of this review paper to know the pathophysiology and basic principles of management (Usool-e-ilaj) of urolithiasis in Unani system of medicine. Urolithiasis is one of the most common disease found in the world. Humankind is known to be suffering from urolithiasis, which was found in tombs of Egyptian mummies dated to 4800 BC. Rhazes writes in *Al Hāwi* that the process of stone formation in any part of the body is secondary to the entanglement of thick and viscid morbid matter in the organs and the inability of the human body to expel the matter. This morbid matter retains in the organs and secondary deposition takes place over time. Adequate fluid intake is the most important conservative strategy in the prevention of urolithiasis. A large number of Indian medicinal plants have been used in the treatment of urolithiasis and they have been reported to be effective with fewer side effects.

KEYWORDS: Urolithiasis, medicinal plants, morbid matter, usool-e-ilaj.

INTRODUCTION

The urinary tract system consists of the kidneys, ureters, bladder and urethra. The kidneys are two bean-shaped organs located below the ribs toward the middle of the back. The kidney removes extra water and wastes from the blood in the form of urine. They also keep a stable balance of salts and other substances in the blood. Narrow tubes called ureters carry urine from the kidneys to the bladder (a triangle-shaped chamber in the lower abdomen like a balloon). The walls of bladder stretch and expand to store urine. They flatten together when urine is emptied through the urethra to outside the body.

Urolithiasis (hisat-e-bauliyah) is a term originated from three Greek words, "ouron" for urine, "oros" for flow, and "lithos" for stone.[3] It is referred to as the process of formation of stone in the Urinary system includes Nephrolithiasis (hisat-e-kulya), Ureterolithiasis (hisat-e-halīb) and Cystolithiasis (hisat-e-mathāna). It is a worldwide problem, sparing no geographical, cultural and racial groups. Urinary stones are one of the major problems and an important cause of morbidity and end stage renal failure in India. Approximately 80% of these calculi are composed of calcium oxalate and calcium phosphate, followed by cystine, struvite and ammonium acid urate stones. The Greek philosopher and physician Hippocrates (460-377 BC) postulated the theory of humoral medicine, upon which the Unani system of medicine is based. Hippocrates contended that there are four humors *Dam* (blood), *balgham* (phlegm), *safrā* (yellow bile) and *saudā* (black bile). These four humors have different colors, appearances, compositions, physical properties and proportions in a body that is in homeostasis. Hippocrates described health as the state in which all four humors are in correct proportion and composition to one another. Thus sickness is thought to occur when any of these humors is deficient or over abundant in the body or undergoes a change in its composition or physical properties. *Mizāj,* or temperament, indicates the state of equilibrium among the four humors. Therefore *temperament* is of four types:- *hararat* (hot), *burūdat* (cold), *yabusat* (dry), and *rutūbāt* (moist). In short, any alteration in the properties or deviation from the homeostatic proportions of the humors, disturbs body temperament leading to diseases.

Pathophysiology

According to Ali Ibn-e-Abbas Majoosi, when more concentrated humors and highly viscous fluid adhere to the calyces of kidney, thus these humors and fluid dried by the high virulent temperature to form crystal and after some time gradually becomes stone.[1] According to Galen, the renal stones are formed due to ulcer of kidney. In case of ulcer pus is formed, when not passed out it consolidates and forms stone.[2] Ibn-e-Sina says that the stone is formed in the kidney by Quwat-e-Faila (active power) which has the raised temperature rather than the normal temperature of kidney and Mādda-al-hasāh (lithic matter) which is a viscous and sticky substance, may be either phlegm or viscous blood or pus. Ibn Sīnā also mentioned that there are differences in the constituents of renal and bladder stones.[4] The renal calculi are soft,

small and usually reddish in colour whereas the bladder stones are hard, large and sandy white or black in colour [6]. Stone formation may also occours due to morbid matter and stasis of morbid matter which is followed by weakness of expulsive power (*Quwat Dafi'ah*). Quwat Dafi'ah expells out morbid matter (bad humours) from more vital organs to less vital and less important organs.[4,9,13]

In modern books the causes of renal calculi as follows:-

1. Deficiency of vitamin A causes desquamation of epithelium and formation of bladder calculi.
2. Dehydration increases the concentration of urinary solutes until they are liable to precipitate result in a tendency for crystal and stone formation. The presence of citrate in urine tends to keep otherwise relatively insoluble calcium phosphate and citrate in solution.
3. Infection favours the formation of urinary calculi.
4. Immobilisation from any cause, e.g. paraplegia, is liable to resulting skeletal decalcification and an increase in urinary calcium.
5. Hyperparathyroidism leading to hypercalcaemia and hypercalciuria, leads to stone formation.
6. Metals and non-metals present in hard water at higher concentration might influence the outcome of the disease. Experimental studies in rats shown that fluoride consumption at higher levels accelerated the incidence of calcium oxalate and bladder stones.

After their initial stone episode the recurrence rate of stone is approximately 10% within one year, 35% within five years and 50% within 10 years.

Types of renal calculus

calcium oxalate	Oxalate stones are irregular in shape hard and radiodense.
Phosphate calculus-	A phosphate calculus is smooth and dirty white. It tends to grow in alkaline urine the calculus may enlarge to fill most of the collecting system, forming a staghorn calculus**.**
uric acid and urate calculi	These are hard, smooth and often multiple. Pure uric acid stones are radiolucent.
Cystine calculus	Hexagonal, translucent, white crystals of cystine appear only in acid urine.
Xanthine calculus	These are extremely rare. They are smooth and round, brick-red.

Clinical features

Renal calculi are common. Approximately 50% of patients present between the ages of 30 and 50 years.

Pain

Pain is the leading symptom in 75% of people with urinary stones. Fixed renal pain is located posteriorly in the renal angle

Ureteric colic

There is a pattern of severe exacerbation on a background of continuing pain, radiates to the groin, penis, scrotum or labium as the stone progresses down the ureter.[6]

Haematuria

Haematuria is sometimes a leading symptom of stone.

Pyuria

Infection is likely in the presence of stones and is particularly dangerous when the kidney is obstructed.

In Unani medicine physician evaluates *nabd* (pulse), *baul* (urine) and *baraz* (stools) in order to diagnose disease and when urolithiasis is suspected, the urine is carefully examined to make the final diagnosis. Patients are advised to collect urine overnight in a clean container that must be protected from contaminants. On the following day, the urine is discarded without disturbing any sediment in the container. Red or yellow sediments are diagnostic of urinary stones.

Diagnosis

Patients with urinary stones usually present with loin pain, vomiting, and sometimes fever, but may also be asymptomatic. Standard evaluation includes a detailed medical history and physical examination. The clinical diagnosis should be supported by appropriate imaging. If available, ultrasound (US) should be used as the primary diagnostic imaging tool, although pain relief or any other emergency measures should not be delayed by imaging assessments. US is safe, reproducible and inexpensive. It can identify stones located in the calyces, pelvis and pyeloureticand vesicoureteric junctions, as well as in patients with upper urinary tract dilatation. For all stones, US has a sensitivity of 19-93% and specificity of 84-100%. Urine samples with unexplained alkalinity should be cultured for *Proteus* and identification of a *Proteus* species in urine should prompt consideration of an evaluation for urolithiasis.[22]

Principles of treatment (Usool-e-Ilaj) in Unani System

Chief actions of the drugs are involved as Mufattit-e-Hisat (Litholytic), Mukhrij-e-Hisat (Lithotriptic), Mudir-e-Baul (Diuretic), Muhallil-e-Waram (Anti-inflammatory) and Muqawwi-e-Gurdah (Nephroprotective).[14,16,20]

Unani drugs produce multiple mechanism of action for example litholytic activity which helps disintegration of large calculi into the smaller particles by forming of soluble complex, Diuretic activity which increase the urinary volume that allows the easy passage of destroyed stone and small calculi out of the body in urine, Lithotriptic activity prevent crystal aggregation to form a

large stone and Anti-inflammatory activities helps to escape the symptoms of stone formation. In Kitābul Kulliyāt, Ibn Rushd writes that the statements of many atibbā that, the drugs used as mufattit hissāt (lithotriptic) must have mild degree of harārat because severe degree of heat makes substances harder, such as the harārat-e-gharībā (abnormal heat) responsible for the formation of renal stones. Hence the amount of harārat in the drugs used as lithotriptic must be less than that required for the formation of stones. Drugs which are used to expel the urinary stones must be talkh (bitter) in taste, not very hot, and have the property of qata'a (cutting, making into small bits). Drugs used for bladder calculi must be slightly hotter than those used for renal calculi.

Management-The treatment of urolithiasis in Unani system of medicine is in two steps:-
(1) Symptomatic treatment given during the attack of pain or renal colic. (2) Curative treatment after the symptoms of pain subsides. Management of urolithiasis done with Ilaj bil Ghiza (Dietotherapy), Ilaj bil Tadbeer (Regimenal Therapy), Ilaj bil Dawa (Pharmacotherapy) and Ilaj bil Yad (Surgery). In Dietotherapy, Plenty of fluid and easily digestible food suppliments like Barley water, coconut water, bitter guard, gram, carrot, pear should be used. Heavy diet (milk, mutton), Diet contains high oxalate like spinach, tomato, cashew nut, cucumber etc. and Uric acid containing diet like cauliflower, Pumpkin, Brinjal etc should be avoided. In IlajBil-Tadbeer (Regimenal Therapy), the main aim of regimenal therapy is softening and resolving of morbid matter (Talteef and Taqtee-e- Maddah)**.** For this purpose ask the patient to vomit out and then mild purgatives like Cardia latifolia (sapistan), Ficuscarica (anjeer), Glycyrrhiza glabra (aslussoos), Althea officinalis (khatmi), Alhagi pseudoalhagi (turanjabeen) is used. Mudir-e-boul (Diuretics) with such medicines not having excess hot temperament like Tukhm-e-Khyarain (Cucumis sativus), Tukhm-e-Kaddu (Cucurbita moschata), Halyoon (Asparagus officinalis), Kaknaj (Physalis alkekengi) etc should be used. *Sitz bath* is very beneficial in urolithiasis. For this purpose the following preparation is mentioned in Qarabadeen-e-Azam; Baboona (*Matricaria chamomile*), Gul-e-Surkh*(Rosa damascena*), Khatmi (*Althea officinalis*), Nakhoona (*Trigonella uncata*) each of 35gm, Post-e- Kharpazah (*Cucumis melo*), Parsiyaoshan (*Adiantum capillus*), Mako (*Solanum nigrum*) each of 25gm, Zoofa (*Hyssopus officinalis*), Irsa (*Iris ensata*), Beekh-e-Badyan (*Foeniculum vulgare*) each of 18gm, Kaknaj (*Physalis alkakenji*), Hulbah (*Trigonella foenum*) each of 14gm, Biranjasif (*Polypodium vulgare*), Gul-e-Banfshah (*Viola odorata*) each of 10gm and Doqu (*Pucedenumgrande*), Gul-e-Neelofar (*Nymphea alba*) each of 4.5gm.[8,10,14]

If obstructive uropathy developed, Huqna (Enema) of Muzliq Luaab (emollient mucilage) like Luaab-e-tukhm-e-Khatmi (Althea officinalis), Luaab-e-Kata'an (Linum usitatissimum), Luaab-e-Hulbah (Trigonella foeniculum) given to the patient and Roghan-e-Badam (Almond Oil) with Maghz-e-Amaltas (Cassia fistula) given orally.

Compound formulaions- (1) *Sharbat-e- Alubalu*
Ingredients are Prunus cerasus (Alubalu) -500gm, Sugar Crystals- 3kg and Lemon extract 8gm. Pharmacological actions are lithotriptic and diuretic. 25ml syrup to be taken with 125ml arq anannas or water.[11,12,15,16]

(2) Qurs Kaknaj
Ingredients are Glycerrhiza glabra (aslussos), Cydonia vulgaris (bahidana), Althea officinalis (khatmi), Malva sylvestris (khubazi), Portulaca oleracea (khurfa), Triticum aestivum (nashashtah gandum) each of 25gm, Cochlospermum religiosum (kateera)-20gm, Papaver somniferum (tukhm-e-khashkhash)-30gm, Cucurbitum pepo (tukhm-e-kaddu), Cucumis melo (tukhm-e-kharbooza) each of 35gm, Cucurbita moschata (sang-e-jarahat)-20gm, Sugar crystal-200gm.[8] Pharmacological actions are Litholytic, lithotriptic, diuretic and Anti-spasmodic. Dosage: 3 tablets twice a day with 125 ml. of Arq-e-Gaozaban and 25 ml. of Sharbat Bazoori Motadil.[12,15,16]

(3*) Kushtah Hajr-ul-Yahood*
Ingredients are Lapis judacius (hajrul yahood)-100gm, Potassium carbonate (jawakhar)-25gm, Raphanus sativus (Aab-e-mooli)-300ml. Pharmacological actions are litholytic and lithotriptic. Dosage: 125 mg. powder put in 5gm of Majun Hajrul Yahood or 3gm of maj'un Aqrab or taken with 20 ml of SikanjabeenSadatwice a day.

(4) Ma'jun Hajr-ul-Yahood
Ingredients are Cucumis melo (tukhm-e-kharbooza)-15gm, Physalis alkakengi fruits (Habb-e-Kaknaj)-15gm, Cucurbita moschata(Tukhm-e-Kaddu)-15gm, Curcumis sativus (Tukhm-e-Khayarain)-15gm, Lapis lazuli (HajrulYahood)-Sugar Crystal-630gm. Pharmacological actions are litholytic and lithotriptic. Method of Use: 5gm of majun taken with fresh water or 25 ml. of Sharbat-e-Bazoori Motadil in morning and evening on empty stomach.[12,16]

(5) Sharbat-e-Bazoori Motadil
Seeds of Cichorium intybus (kasni)-250gm,Cucumis sativus (khayarain)-250gm, Cucumis melo (kharbooza)-250gm, Roots of Foeniculum vulgare (badyan)-250gm, roots of Cichorium intybus (kasni)-250gm, Sugar crystal-10kg and Lemon extract- 25gm. It act as diuretic mainly. Dosage-25ml twice a day with fresh water.[12,15,16]

(6)Ma'jun Aqrab
Physalis alkekengi (Beikh-e-Kaknaj)-55gm, roots of Gentiana lutea (Juntiyana Roomi)-45gm, Castorium (Jundbedastar)-10gm, Burnt Scorpion (Aqrab Sokhtah)-35gm, Piper nigrum Fruits (Filfil Siyah)-50gm, rhizome of Zingiber officinalis (Zanjabeel)-25gm, Sugar-660gm. Pharmacological action are Litholytic and lithotriptic. Method of Use: To be taken with water or 60 ml. of Arq-

e-Badyan or 25 ml. of Sharbat-e-Bazoori Motadil, in morning and evening before meal.[12,15,16]

If stone becomes larger and very painful, then surgical intervention should be done for removal of stone.[7]

CONCLUSION

A large number of patient is suffering from urolithiasis. It is the major problem and an important cause of morbidity and end stage renal failure in India. Stones are mainly formed by Calcium oxalate, Phosphate and less amount of stones are formed by Cystein, urate, and Xanthine. The Greek philosopher and physician Hippocrates postulated humoral theory upon which temperament of body is based. Any alteration in the properties or deviation from the homeostatic proportions of the humors, disturbs body temperament leading to diseased conditions. The main principle of treatment of diseased condition in Unani system, is to revert back the temperament and humours in normal equilibrium. Majoosi says that when more concentrated humors and highly viscous fluid adhere to the calyces of kidney, thus these humors and fluid dried by the high virulent temperature to form crystal and after some time gradually becomes stone. The main feature of renal stones are pain, ureteric colic, haematuria, and pyuria. In unani system of medicine, diagnosis can be done with Pulse, Urine and Stool. The basic principles of treatment (Usool-e-ilaj) of urolithiasis done with Ilaj-bil-Ghiza (Dietotherapy), Ilaj-bil-Tadbeer (Regimenal Therapy), Ilaj-bil-Dawa (Pharmacotherapy) and Ilaj- bil- Yad (Surgery).

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