INTERNATIONAL
AYURVEDIC
MEDICAL JOURNAL

IAMJ

Research Article ISSN: 2320 5091 Impact Factor: 4.018

EXPERIMENTAL APPRAISAL OF AN INDIGENOUS HERBAL COMPOUND ON ASHMARI (UROLITHIASIS)

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Published online: January, 2019

ABSTRACT

Ashmari (Urolithiasis) is a common global problem in the world since antiquity. Different therapies have been put forward from time to time and are capable to remove the formed stone, but hardly have any effect on prevention of recurrence. In *Ayurveda Parnabeej (Bryophyllumpinnatum)* and *Varuna (Crataevanurvala)* have been described as useful remedy for urolithiasis. In this present work the effect of total extract of *parnabeej and Varuna* were studied on urolithiasis model. An experimental study was conducted taking 40 albino rats at Centre of Experimental Medicine and Surgery Department of Banaras Hindu University, Varanasi. They were grouped into control, preventive and treatment. All Albino rats were intervened with the implantation of zinc bead in the urinary bladder following Suprapubic cystostomy under intraperitoneally injected pentobarbitone sodium in a dose of 30-60 mg /kg body weight. An Ayurvedic drug *quath* extract (taking equal quantity of *Bryophyllumpinnatum* and *Crataevanurvala)* was given to the experimental albino rats in a dose of 35 mg/100 gm body weight to Preventive group (7 days before and 30 days after implantation) and 30 days after implantation to Treatment group. Study period was of two months and Urine out, Urine pH, Plasma electrolytes and Urinary electrolytes were evaluated in a period of 15days interval and also plain x-ray abdomen done in all the groups. After adopting statistical procedure the experimental observation shows statistical significant in increasing Urine output in both Preventive and Treatment group whereas Urine pH was remarkably decreased to normal. Serum Calcium, Serum phosphorus, Serum Sodium& Urinary sodium were also shown remarkably decreased. The size of the stone is also decreased remarkably in preventive and treatment group in comparison to control group.

Keywords: Urolithiasis, *quathextract* (dried water extract), Suprapubic cystotomy.

INTRODUCTION

Mutrashmari is a formidable disease resembling with *'Yama'* the god of Death. It is classified under *Astamahagada* (eight fatal conditions) in Ayurvedic classics. On the basis of similarity in the clinical findings it is compared to Urolithiasis. The incidence of urinary stone disease is very high in northern India, Pakistan and Northern Australia. According to the statistics of National Kidney Foundation, kidney and urologic diseases affect at least 5% of the population among them Urolithiasis is about 1-15%. It is a consequence of complex physiochemical process which involves sequence of events in the formation of urinary stone. The conventional treatment available for the disease is only to surgical removal of stone from the system which is quite expensive and beyond the reach of common men and the conventional drugs are also failed to prevent the recurrence of stone formation. Consequently, quest for establishment of an effective and cheaper antiurolithic drug is the need of the hour. India is endowed with a rich diversity of medicinal plants and traditional medicinal knowledge. In Ayurveda number of effective drugs like Bryophyllum pinnatum and Crataeva nurvala has been mentioned againsturolithiasis. In the present study the effect of bryophyllum pinnatum and Crataeva nurvala were studied in experimental urolithiasis.

Plan of Study: The present experimental study was undertaken to:

1. Produce vesical calculus by implanting zinc pallets in urinary bladder of albino rats.
2. Observe the influence of drug on formation and growth on vesical calculus.
3. Find out the effect of this drug on serum and urinary electrolytes.
4. Observe prophylactic value of the drug on formation and growth of vesicle calculus.

Material and Method:

Whole plant parts of Parnabeej *(Bryophyllumpinnatum* Lam.) and stem bark of Varuna (*Crataevanurvala*Buch. - Ham.) were procured from the local herb supplier of Kolkata and were authenticated by the Institute as per usual norms. Both the drug were cleaned, shed dried and cut in to small pieces and kept in a separate vessel. Decoction of the above drugs was prepared separately as per the methods mentioned in Ayurvedic classics.

Chemical and Material-The analytical grade of following material used for the present study were locally purchased.

1. Calcium Phosphate;
2. Calcium oxalate;
3. Uric acid;
4. Ethanol;
5. Trial drug (Dried aq. extract of Bryophyllumpinnatum & Crataevanurvala);
6. pH meter.

40 albino rats of either sex weighing between 250-360 grams were selected for the study.They were kept in animal room at a temperature between 20-25^0 C and were given 10-15 grams balanced diet and adequate drinking water. The albino rats were divided in to four groups.

Group A: Control group-treated by distilled water,

Group B: Preventive group: Administration of 25% aqueous *kwath* solution of both herbs, (before implantation of zinc pallet in urinary bladder).

Group C: Treatment group by *Kwath* decoction.

Parnabeej and *Varuna*

Preparation of dried aqueous extract

500 gm whole plant of *parnabeej (Bryophyllumpinnatum)* and 500gm Stem bark of *Varuna (Crataevanurvala)* were procured from the local market and authenticated as per Institution norm .Then the drug was cleaned and dried under shade. *Kwatha* (dried aqueous extract) of the above drug has been prepared separately as per the procedure mentioned in *BhaishajyaRatnavali* text & *Yoga Ratnakar*. Then the filtered substance was dried for 72-80 hrs and kept in an airtight vessel in powder form for experimental use.

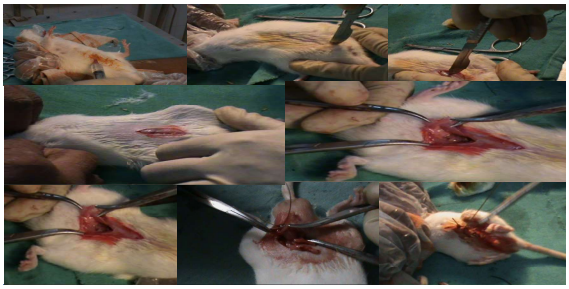
Dose and mode of administration of drug: Total extract of the combine drug were used at a dose of 35mg/100 gram body weight. The drug was given orally by esophageal intubation with the help of fine feeding tube. All the animals were kept in metabolic cages, 24 hrs water intake, urine output, pH of urine, urinary calcium, phosphorus and creatinine were estimated.Blood samples were collected by direct syringing from heart or through capillary tube by puncturing the ophthalmic artery and subjected for estimation of serum calcium, serum phosphorus, serum creatinine and serum uric acid.

In group A, B and C intravesical implantation of measured zinc pellets were done after opening the bladder to produce experimental urolithiasis; total extract was given for 15 days prior to intravesical implantation of zinc pellets.

The experimental study was continued for two months. The growth of the stone was observed periodically with the help of X-ray, urinary output, urinary pH, water intake were recorded and on every 15 days interval samples were send for estimation of urinary and serum electrolytes.

Observation:

Observation of water intake, urine output, urinary pH and estimation of urinary calcium, urinary phosphorus, urinary creatinine and serum uric acid as follows:



A. Water intake: Water intake observed in experimentalmodel in ml/24 hrs.The water intake gradually increased in all groups excepts in group A(control) (Table 1)

Table 1: Effect of Drug on 24 hrs water intake

Groups	Mean initial(ml/24hrs)	Mean (ml/24 hrs)			
		15 days	30 days	45 days	60 days
A	17.37	16.87	16.12	16.0	16.80
B	17.60	18.12	18.70	19.5	21
C	17.50	10.20	20.70	22	24.90

B. Urine output: During the period of study the urine output was gradually increased in group B&C. While in control group i.e., in group –A mean initial urine output was 9.12 ml/24 hrs and gradually decreased upto 6.36 ml/24 hrs during the period of study.

Table 2:

Groups	Mean Initial(Ml/24 hrs)	Mean(ml/24 hrs)			
		15 days	30 days	45 days	60 days
A	9.12	8.68	9.25	8.37	9.36
B	9.12	9.56	11	12.12	12.75
C	9.10	11.10	12.80	14.70	16.50

C. Urine pH: The mean initial pH was alkaline i.e., 10.6, 11.1 and 11.1 in group A, B, & C respectively. But it almost stationary in group A. In other groups (B&C) the urinary pH gradually decreased. In group C it gradually decreases to neutral. Table 3.

Table 3: Effect of Drug on 24 hrs Urinary pH

Groups	Mean Initial pH	Mean pH			
		15 days	30 days	45 days	60 days
A	10.6	10.70	10.4	10.62	18.1
B	11.0	10.60	9.2	8.6	8
C	11.1	10.65	10	8.2	7

D. Urinary Calcium: The label of Urinary Calcium was almost stationary in control group i.e., group A. But in group B and C labels urinary calcium is decreased from their mean initial value i.e., 1.40&1.38 mg/24 hrs to 0.5 and 0.7 mlg/24 hrs respectively (table4).

Table 4: Effect of drug on Urinary calcium

Groups	Mean Initial (mg/24 hrs)	Mean(mg/24 hrs)			
		15 days	30 days	45 days	60 days
A	1.2	1.3	1.16	1.3	1.17
B	1.4	1.2	0.96	0.73	0.50
C	1.38	1.24	1.06	0.86	0.70

E. Urinary phosphorus Urinary phosphorus was also stationary in control group A, while in group B&C it gradually decreased from 15.82 &15.80, to 11.60&9.60 mg/24 hrs respectively within a period of 60 days (Table5).

Table 5: Effect of drug on Urinary phosphorus

Groups	Mean Initial (Mg/24 hrs)	Mean(mg/24 hrs)			
		15 days	30 days	45 days	60 days
A	15.72	16.30	16.02	15.75	15.50
B	15.82	15.25	14.25	13.37	11.60
C	15.8	13.4	11.9	10.8	9.6

F. Urinary creatinine: No change was observed in urinary creatinine level in control group. Where as in group B&C the level was gradually decreased from 19.80&19.74 mg/24 hrs to 13.00, 11.6 mg/24 hrs respectively within a period of 60 days (table 6).

Table 6: Effect of Drug on urinary creatinine

Groups	Mean Initial (mg/24 hrs)	Mean(mg/24 hrs)			
		15 days	30 days	45 days	60 days
A	19.70	19.86	20.06	20.80	20.5
B	19.80	19	17.50	15.5	13.0
C	19.74	18.30	16.90	13.40	11.60

G. Serum calcium: The serum calcium level in group B&C was gradually decreased in compare to control group (Table 7)

Table 7: Effect of Drug on serum calcium

Groups	Mean Initial (mg/24 hrs.)	Mean(mg/24 hrs)			
		15 days	30 days	45 days	60 days
A	10.2	10.70	11.50	10.3	10.1
B	10.3	10.	9.12	8.6	8
C	10.2	9.7	9.10	8.3	7.5

H. Serum phosphorus: Similar observation i.e., decreased level of serum phosphorus also found in all groups except control group(Table 8)

Table 8: Effect of drug on Serum phosphorus

Groups	Mean Initial (Ml/24 hrs)	Mean(ml/24 hrs)			
		15 days	30 days	45 days	60 days
A	9.83	10.1	10.9	11.6	10.1
B	9.75	9.6	9.0	8.5	7.6
C	10.50	8.6	8.2	7.3	6.3

I. Serum creatinine: Like serum calcium and serum phosphorus the level of serum creatinine was also stationary in control group while in other groups the level was remarkably decreased after 2 months (Table9)

Table 9: Effect of drug on serum creatinine

Groups	Mean Initial (mg/24 hrs)	Mean(mg/24 hrs)			
		15 days	30 days	45 days	60 days
A	19.62	19.87	20.5	20.62	20.25
B	19.75	18.87	17.5	16.32	14.62
C	20.20	18.30	16.9	15.6	14

J. Serum uric acid: There was no significant change observed in serum uric acid level as most of the stone are either calcium oxalate or calcium phosphate in nature was confirmed by stone analysis (Table 10)

Table 10: Effect of drug on serum uric acid

Groups	Mean Initial (mg/24 hrs)	Mean(mg/24 hrs)			
		15 days	30 days	45 days	60 days
A	8.3	8.1	8	7.75	7.8
B	8.3	8.1	8.15	8	8
C	8.4	8.3	8.30	8.14	8

K. Growth of Stone

In control group formation of stone in urinary bladder was observed in all experimental animal and in some animal the size of the stone was big and multiple. The stones were shining, whitish, smooth and compact. After 60 days the mean net weight of stone was 1407.8 mg where as in other groups B&C though there was formation of stones but the size of stones were small, brittle and irregular. In some animals there was very minimum deposition of stone over nidus was observed.

Table 11: Effect of drug on growth of the stone

Group	Bits in mg (A)	Wt of formed stone in mg (B)	Net wt of stone (B-A)
A	17.2	1425.00	1407.8
B	16.5	51.75	35.25
C	17.2	24	6.80

DISCUSSION

Bryophyllumpinnatum is a good antimicrobial drug as it contains Phenolic compounds, phenolate, quinolone, Flavanoids; 5 methyl 4,5,7 trihydroxyl flavones, 4,3,5,7 tetrahydroxy 5methyl 5 propenamineanthocyanidines and so drug acts as an antiseptic, antifungal, bactericidal. Drug also shows potent inhibition on staphylococcus aureas, Pseudomonas aeruginosa, klebsiella and candid albicans, Drug also inhibit cyclo-oxygenase, lipo-oxygenase pathway, there by actas an anti-inflammatory activity. When the Zinc beads are placed in-situ, the drug may combat the bacteria to produce urease or urea amydohydralase, rendering no change in pH of theurine. The drug also reduces enzymurea, urease or urea amidohydralase. The main component of *crataevanurvala* is Lupeol. Lupeol proves to have good action on urolithiasis in a dose of 30mg/kg/body weight. It is a potent antiurolitholytic activity, normalizes pH and Specific gravity5, 15. Lupeol is proved to reduce oxalate level, reduced liver glycolate oxidase activity. As the *Crataevanurvala* drug possesses Oxalate oxidase, it will help to degrade to oxalate. It catalyzes the oxygen dependant oxidation of oxalate to CO with concomitant formation of H2O2. Reduce crystallization9, 16 It also reduce oxalate, phosphate, calcium of the plasma and urine. Drug also inhibits the release, synthesis and production of cytokines prostaglandins, histamine and polypeptide kinins and also decrease inflammation and complement activity as drug is enriched with Cadabicine & Catechin which acts as Cyclooxygenase inhibitor. The drug also contains Fattyacids (*B.Pinnatum)* which acts as an immunomodulating effect invivo. Experimental model proves its uorlitholytic effect against 0.75% of ethylene glycol and remarkably diminished the crystal deposition in the Kidney. Chloroform extract of stem bark of *C. nurvala* is reported to be effective against both gram positive (B. cereus) and gram negative (*E. coli*) mediated urinary tract infection. Alcoholic extract of Crataevanurvala (250 and 500 mg/kg for 10 days) proves its protective activity against cisplatin (5 mg/kg) induced nephrotoxicity. Ethanolic extract of root bark of *Crataevanurvala* (150 and 300 mg/kg) shows wound healing and collagenation potential invivo. .Solubility is a function of pH 2, 3 If pH is maintained to neutral then it increases aqueous solubility1, 4. A Drug can be efficiently solubilized by pH control should be either weak acid with low pKa or a weak base with high pKa.

CONCLUSION

In experimental animal the drug increases urinary output and acts as a diuretic without causing electrolyte imbalance.The trial drug reduces pH due to presence of citric acid and isocitricacid, citrate prevent calcium to combine with oxalate or phosphate in urine.Thus it prevents deposition of calcium oxalate and phosphate and reduce the chances of formation of stone.It also reduce serum and urinary electrolyte which is responsible for formation of stone.So the observation suggest that the drug prevents formation of stones and even disintegration by soft surface and brittle in nature.

REFERENCES

1. Ancient Indian Surgery by Dr. G.D. Singhal &Collegues, based on Sushruta Samhita Chikitsha S than 7th Chapter page 161-180.
2. Ancient Indian Surgery by Dr. G.D. Singhal & Collegues, based on Sushruta Samhita uttar tantra 58th Chapter page 467-483
3. Dravygunavigyan by Acharya priyabrata Sharma Vol – II page no.650-652, 652-654& 787-788.
4. Mehta and J.U. Bhat. Studies on Indian Medicinal plant II, bryophyllin, a new antibacterial substance from leaves of *Bryophyllum, CalycinumSalsib. J University Bombay*. 21: 21-25(1952).
5. J Nephrol. Urinary pH and stone formation.2010 Nov-Dec;23 Suppl 16:S165-9
6. MedizinischeKlinik, SpitalZimmerberg, Wädenswil. b.hess@spital-zimmerberg.ch. [Pathophysiology, diagnosis and conservative therapy in calcium kidney calculi]. *1998 Sep-Oct; 126(9-10):394-8.*
7. Almeida AP, Da Silva SAG, Souza MLM, Lima LMTR, Rossi-Bergmann B, Goncalves de Moraes VL, and Costa SS. Isolation and Chemicals Analysis of a fatty acid fraction of *Kalanchoe Pinnata*with a potent lymphocyte suppressive activity. Planta Medica 2000; 66:134-137.
8. SA, Noleto GR, Souza ML, Moraes VLG. Immunosuppresive effect of the aqueous extract of *Kalanchoe Pinnata*in mice. Phytotherapia 1994; 8:399-402.
9. Afzal M, Gaurav G, Kazmi I, Rahman M, et al. Anti-inflammatory and analgesic potential of a novel steroidal derivative from Bryophyllumpinnatum. Fitoterapia 2012; 83:853 – 858.
10. Igwe SA, Akunyili DN. Analgesic Effects of Aqueous extracts of the leaves of *B. Pinnatum.* Pharmaceutical Biology 2005; 43(8):658-661.
11. Wagner CA, Mohebbi N. Urinary pH and stone formation. 2003 Feb;60(2):79-87
12. Analgesic effects of aqueous extracts of the leaves of Bryophyllumpinnatum / S AIgwe and D N Akunyill / Summary Pharmaceutical Biology • 2005; 43(8):658-661.
13. Studies on the anti-ulcer activity of a Bryophyllumpinnatum leaf extract in experimental animals / Siddhartha Pai and A K Nag Chaudhuri. J Ethnopharmacology, 1991;22(1): Pages 97-102.
14. Harlalka GV, Patil CR. Protective effect of *Kalanchoepinnata*pers.(Crassulaceae) on Gentamicine induced nephrotoxicity in rats. Indian J Pharmaccology 2007; 39(4):201-205.
15. Karwani G, Singhvi IJ, Kapadiya NJ, Agarwal N. heparoprotective activity of Crataevanurvala in carbon tetra chloride induced hepatotoxicity in rats. Inventi Rapid: Ethnopharmacol 2011; 2011(1):84-92.
16. Varatharajan S, Coothan KV, Palaninathan V. Antiurolithic effect of lupeol and lupeol linolate in experimental hyperoxaluria. J Nat Prod 2008; 71(9): 1509-12

Source of Support: Nil
Conflict Of Interest: None Declared

How to cite this URL: L. D. Barik et al: Experimental Appraisal Of An Indigenous Herbal Compound On Ashmari (Urolithiasis). International Ayurvedic Medical Journal {online} 2019{cited January, 2019} Available from: http://www.iamj.in/posts/images/upload/1514_1520.pdf