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## Clinical evaluation of Antimicrobial activity of *Kantakari* (*Solanum xanthocarpum* Schrad & Wendl) in Lower Urinary Tract Infection (*Mutrakruchchra*)

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### ABSTRACT

Infectious diseases still possess a threat to mankind. Lower Urinary tract Infection (LUTI) is the second most common infection affecting human beings. The symptoms of 'mutrakruchchra' mentioned in *Ayurveda* closely correspond to the symptoms of LUTI. Resistance to antimicrobial agents is a rising concern today. Various herbal extracts are being studied constantly for their antimicrobial activities as the problem of microbial resistance is increasing. *Kantakari* is widely available traditionally used Ayurvedic herb. References from Ayurvedic literature suggests *Kantakari* (*Solanum xanthocarpum* Schrad&Wendl) to be effective in *Mutrakruchchra*. Total 60 patients of Lower Urinary tract infection involved in this clinical trial were randomly divided into two groups. Group A of 30 patients were administered *kantakari panchang kwath* (Decoction) for a period of 7 days and Group B of 30 patients were subjected to Tab Norflox TZ for 5 days. The observations were recorded and analysed statistically on the basis of objective parameter of reduction in pus cells in both the groups. Symptomatic relief in group A (*Kantakari kwath*) was 89.11% and that in group B was 92.16%. Paired t test applied in group A and B were extremely significant at p value <0.0001. Unpaired 't' test between both groups was not significant. *Kantakari* showed equivalent results as compared to standard antibiotic. It was found to be effective single herb in *Mutrakruchchra*.

### KEYWORDS

Lower Urinary tract Infection, *Mutrakruchchra*, *kantakari*, Antimicrobial activity



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## INTRODUCTION

Lower Urinary tract infections (which can be correlated to Mutrakruchchra in Ayurveda), is a rising health problem and affects large population across the globe every year. *Kantakari* (*Solanum xanthocarpum Schrad&Wendl*) is a well-known Ayurvedic herb and also a part of famous combination 'dashamool'. Acharya *Sushruta* has quoted-

**निदिग्धिकायाः**

**स्वरसंपिबेत्कुडवसम्मितम्।**

**मूत्रदोषहरं कल्यं अथवा क्षौद्रसंयुतम्।**

**(सु.उ.५८/३९)**

It means *kantakari* juice is effective with or without honey in urinary complaints and disorders<sup>1</sup>. It is also advised in *krimi* and *ama*. With this view, *Kantakari* was selected for study.

## AIMS AND OBJECTIVES

- To evaluate the Lower Urinary tract infection as per Ayurveda
- To do the clinical evaluation of Antimicrobial activity of *Kantakari*(*Solanum xanthocarpum Schrad & Wendl*) in Lower Urinary tract infection(*Mutrakruchchra*)
- To compare the Antimicrobial activity of *Kantakari*(*Solanum*

*xanthocarpum Schrad & Wendl*) with standard antibiotic *Norflox Tz*

## MATERIALS & METHODS

*Kantakari* was reviewed in *Samhitas* (classical texts) and *nighantus* (lexicons) of Ayurveda. Also, the recent researches on *kantakari* were scrutinized. The test drug was standardized before using in clinical trial. The randomized clinical study was undertaken in O.P.D of Ayurved Mahavidyalaya, Sion, Mumbai after approval of Institutional Ethical Committee (Institutional Ethical committee approval no-AMS/1950/2018/1). Total 60 patients involved in this trial were randomly divided in two groups. 30 patients in group A were given *Kantakaripanchangkath* 30-40 ml before meals thrice a day for 7 days and 30 patients in Group B were given Tab *Norflox Tz B.D* for 5 days. Observations were recorded and results were discussed based on statistical analysis.

## CRITERIA OF SELECTION OF PATIENTS-

### Inclusion criteria:

Age: 16-70yrs, Sex: male and female both included.

Informed and consent signed.

Patients having sign and symptoms of *mutrakruchchra* (Lower Urinary Tract Infection) with positive Urine Microscopy



(pus cells  $\geq 5$ ) and Urine culture [(growth of organism  $\geq 1$  lakh/ml)(If necessary).]

Signs and symptoms of *mutrakrchhra*: -

- *Sakruchchramutrapravritti* (Dysuria).
- *Sadahamutrapravritti* (burning micturition).
- *Vankshanbastimedhrashoola* (Suprapubic pain).
- *Muhurmuhurmutrapravritti* (Increased frequency of micturition).

**Exclusion criteria:**

- Patient with sterile urine specimen (Pus cells in Urine  $\leq 5$ )
- Patient with complication of disease like Upper U.T.I, sepsis and C.R.F, B.P.H, Renal calculi.
- Those suffering from T.B, Malignancy, Diabetes mellitus
- Patient with severe systemic illness and immunocompromised persons.
- Pregnant and lactating women.

**Drug administration details:**

- Drug source: - *Panchanga* (roots, fruits, leaves, stem, flowers) of Kantakari (*Solanum xanthocarpum*. S & W.)
- Formulation: Decoction (*kwath*).
- Mode of Administration-Oral.
- Dose – 30 to 40ml T.D.S *Kaal*: Before Meals (*Prabhakta*)

**Follow-up:** 3 days after first visit. 7 days after first visit

**Assessment criteria-** SUBJECTIVE:

Symptoms mentioned in text were assessed at each follow up. Symptoms were arbitrarily graded into 4 grades (0-3) on basis of severity.

1) *Sakruchchramutrapravritti* (Dysuria).

- No pain - 0
- Mild pain while micturition - 1
- Moderate pain while micturition - 2
- Severe pain while micturition-3

2) *Sadahamutrapravritti* (Burning micturition).

- No burning sensation- 0
- Mild burning sensation while micturition- 1
- Moderate burning sensation while micturition - 2
- severe burning sensation while micturition-3

3) *Vankshanbastimedhrashoola* (Suprapubic pain).

- No pain - 0
- Mild pain - 1
- Moderate pain - 2
- Severe pain -3

4) *Muhurmuhurmutrapravritti* (Increased frequency of micturition).

- frequency 4-6times a Day/1-2 Night- 0
- frequency 7-10 times a Day/3-4 Night - 1
- frequency 11-14 times a Day/5-6 Night - 2
- frequency >15 times a Day/7 Night -3



**OBJECTIVE CRITERIA-** Urine-Routine, microscopic and culture Examination

Statistical analysis was done for the objective criteria of decrease in pus cells in urine microscopic examination by applying Paired student 't' test in individual groups and unpaired 't' test between both the groups.

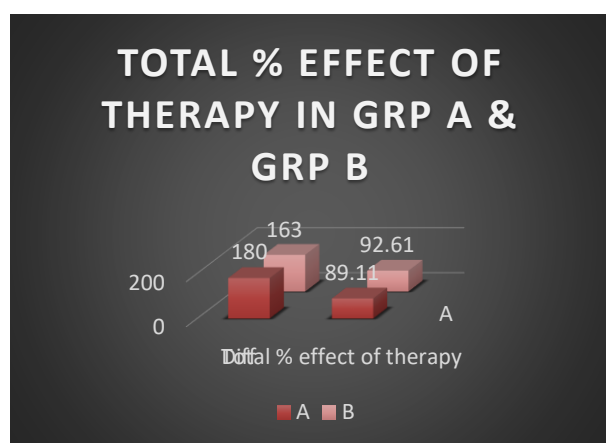
## RESULTS

Evaluation of the study was done statistically. Total symptomatic percentage relief (Table1.) in group A (test drug *Kantakari panchang Kwath*) was 89.11% and B (Standard antibiotic-Norflox TZ) was

92.61%. that is both *Kantakari panchang kwath* and standard antibiotic showed significant relief (> than 75%) in symptoms of L.U.T.I(Figure 1.). Objective parameter (Table 2.) assessed in both groups before and after the treatment was Pus cells (leucocytes). In Group A, value was 8.073 with 29 degrees of freedom ( $n-1$ ) for which p value is < 0.0001, considered extremely significant (at 95% confidence interval) In Group B, t value was 4.926 at 29 degrees of freedom ( $n-1$ ) for which p value is < 0.0001, considered extremely significant at 95% confidence interval.

**Table1** Total effect of subjective parameters

Group A		Group B	
Symptom	% relief	Symptom	% relief
<i>Sakrucchramutrapravrutti</i>	86.36	<i>Sakrucchramutrapravrutti</i>	90
<i>Sadaha mutra pravrutti</i>	88.23	<i>Sadaha mutra pravrutti</i>	92.5
<i>Vankshanbastimedhrashool</i>	91.66	<i>Vankshanbastimedhrashool</i>	95.23
<i>Muhurmuhurmutrapravrutti</i>	91.89	<i>Muhurmuhurmutrapravrutti</i>	94.11
<b>Total</b>	<b>89.11%</b>	<b>Total</b>	<b>92.61%</b>

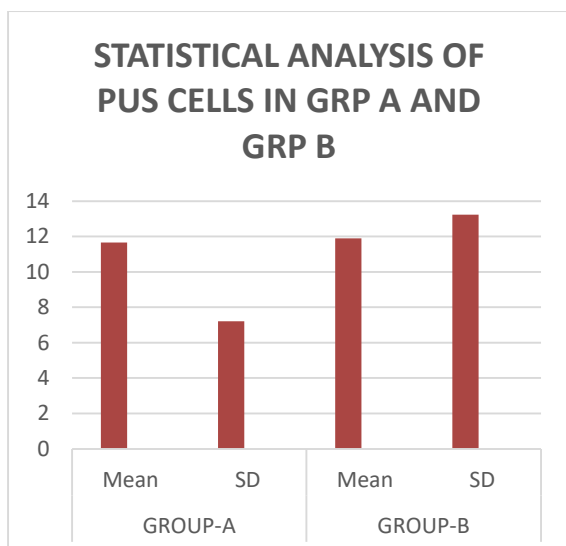


**Fig 1** Graphical representation of Total Percentage effect of Therapies in Grp A and Grp B

**Table 2** Statistical Analysis for Objective Criteria (Pus Cells/Leucocytes)-

CRITERIA	GROUP-A			GROUP-B		
	Mean( $\bar{x}_1$ )	SD	n	Mean ( $\bar{x}_2$ )	SD	N
<b>PUS CELLS (LEUCOCYTES)</b>	11.667	7.216	30	11.900	13.232	30

t value for unpaired t test between group A and B was 0.08479 at 58 degrees of freedom and obtained p value is 0.9327, considered not significant at 95% confidence interval(Figure 2). p value for unpaired t test between two groups is considered not significant.



**Fig 2** Graphical representation of statistical analysis of pus cells in Grp A & Grp B

## DISCUSSION

Hetus of *mutrakrucchra* disease highlight *tridoshaprakopakahetus* in disease formation<sup>2</sup>. There are 2 *sampraptis* of this disease, either vitiation of all three *doshas* or vitiation of individual *doshas*, followed by further *samprapti*<sup>2</sup>. Symptoms of *mutkruchchra* correlate with the symptoms of L.U.T.I and *Mutrakrucchra* is categorized into *santarpanothavyadhi*. *Pakvaashaya* is the place for urine formation according to *Ayurveda*. The relation between *pakvashaya* and *basti* needs to be studied further. *Escherichia coli*, the main causative organism of U.T.I is the normal resident of intestine, unless it gains entry in bladder.

### ❖ Antimicrobial Activity-

Besides the *Krimighna*, *vishaghna karmas*, *Deepan* and *Paachan karmas* of *dravya*

should be thought of while understanding antimicrobial activity in my opinion. *Mutrakrucchra* is a *santarpanothavyadhi* which means the pathogenesis consist of *kaphavrudhi*, followed by *dhatwagnimandya* and *ama (kleda)* formation. *Kleda* is the origin of *krimis*. So, treatment should aim at two levels-

- To treat *dhatvagnimandya-deepana*.
- To remove *kleda-pachana*. This specifically means the '*ama*'*pachana karma*.

*Kleda* is also known as the *ama* formed at the *dhatu* level due to *dhatvagnimandya*. Normally it is carried out of body through urine (*Mutrasya kledavahanam*). However, in infection, *kleda* increases due to *dhatwagnimandya*, it is carried by urine, which is stored in bladder. Due to factors like *vegavidharana* etc, this urine facilitates growth of *krimis*(microorganisms). So basic treatment in UTI should be *deepan* and *paachana* at *dhatwagni* level. Thus, *dravyas* having these two properties should be wisely selected while implementing them as antimicrobials.

**Probable mode of action of Kantakari in Sampraptibhanga of L.U.T.I (*Mutrakrucchra*) (Figure 3)-** *Tikta, katu rasa* and *rukshagunas* account for *kapha shaman*, the *tikta rasa* also contribute to



*amapachana* and body through *mutra* (as quoted *rasa,raktadhatwaagnideepana*. It *mutrasyakledavaahanam*) as it has diuretic facilitates the removal of *kleda* from the property.

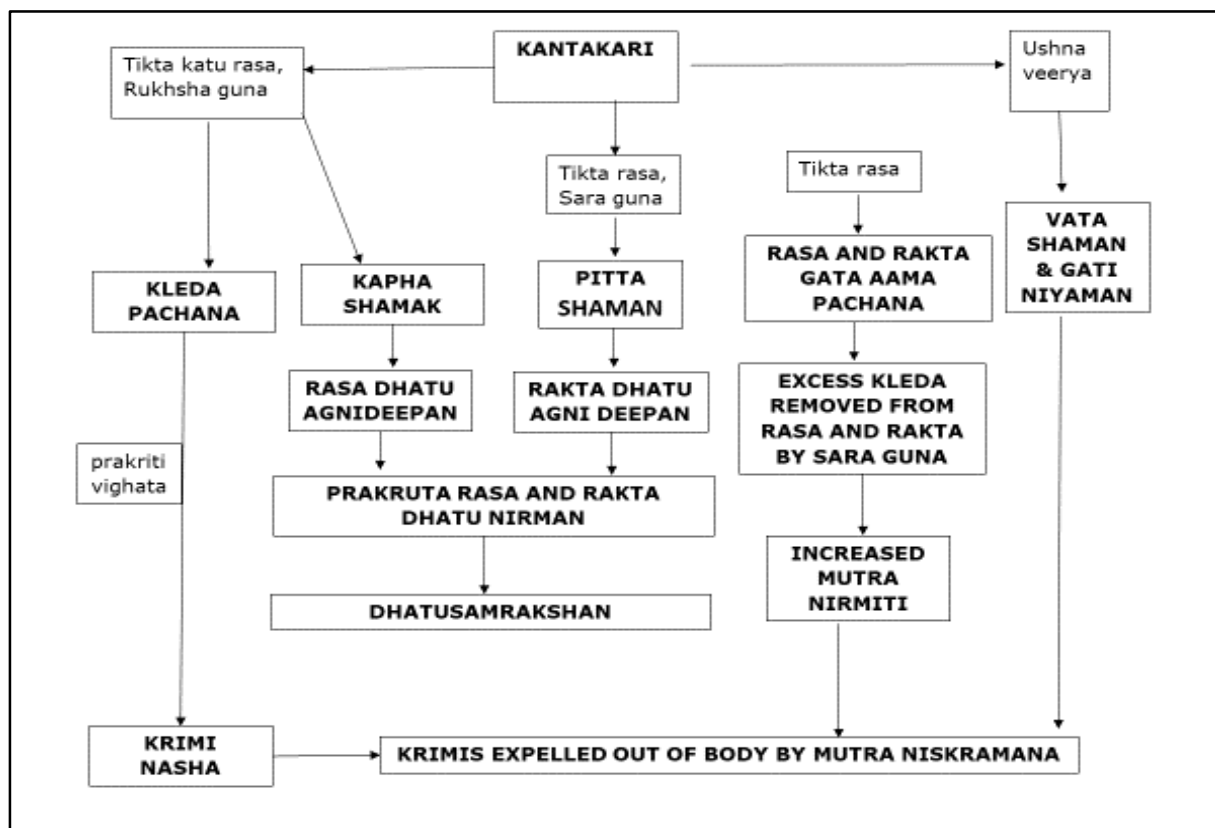


Fig 3 Diagrammatic representation of Probable mode of action of Kantakari in L.U.T.I. (Mutrakruachra)

❖ **Discussion on Clinical Study-** Demographic analysis revealed that Lower urinary tract infection (*mutrakruachra*) affected female population more in comparison to male (Out of total 60 patients 23(38.33%) were males and 37 (61.66%) were females.). It affected maximum population with 61-70 years of age. It manifested more in persons with mixed diet, in those with *madhyamkoshtha* and those whose *agni* was *manda*. Maximum affected population i.e 48 (80%) had tendency of *vegavidharan*, 12(20%) had no

such tendency). Maximum microorganism isolated in culture was *Escherichia coli* (Out of 60 patients, 76.66% were infected with *Escherichia coli*, 16.66% with *enterococcus faecalis*, 3.33% *Klebsiella pneumoniae*, 1.66% with *proteus mirabilis*, 1.66% from *pseudomonas aeruginosa*). Symptomatic relief was excellent in both the groups (*kantakarikwath* and Tab. NorfloxTz) after intervention. Also, the pus cells decreased significantly in both the groups after treatment. Overall effect of therapy was excellent in both groups.



## CONCLUSION

It is the need of time to explore the unknown and uncommon medicinal properties of known ayurvedic herbs. On the basis of this study it can be concluded that *Kantakari* is a drug with good antimicrobial activity in lower urinary tract infection.

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**Conflicts of interest-** None.





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