

## FROM MUTRAKRICHHRA TO UTI: A HISTORICAL REVIEW OF DISEASE UNDERSTANDING ACROSS ERAS

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### ABSTRACT

Urinary tract infection (UTI) is one of the most common infectious diseases affecting humans across all age groups and sexes. The understanding of UTI has evolved significantly from ancient times to the modern era, reflecting advances in medical knowledge, diagnostic techniques and therapeutic approaches. Historical descriptions of urinary disorders can be traced back to ancient civilisations, including Egyptian papyri, Greek and Roman medical texts and traditional medical systems such as Ayurveda and in all Vedic Kala, Purana Kala and Samhitha Kala, where conditions resembling UTI were described based on symptomatology such as dysuria, frequency and turbidity of urine. In Ayurveda, disorders like *Mutrakrichhra* and *Mutraghata* were elaborately explained with emphasis on *Dosha* involvement, etiological factors and holistic management. The medieval period witnessed limited progress due to a lack of microbiological understanding. However, the Renaissance and post 19<sup>th</sup> century era marked a turning point with the discovery of microorganisms, the development of microscopy, and the identification of causative pathogens such as E.coli. The advent of antibiotics revolutionised UTI management in the 20<sup>th</sup> century, though rising antimicrobial resistance has emerged as a major global concern. This historical overview highlights the progressive evolution in the conceptualisation and management of UTI, emphasizing the need to integrate traditional knowledge with modern scientific advancements for effective and sustainable care.

**KEYWORDS:** UTI, Mutrakrichhram, History, Kala, Ayurveda.

## INTRODUCTION

Ayurveda originated around 5,000 years ago, with significant developments recorded in the Ayurvedic texts from the Samhita era. These texts mark a significant period in the development of Ayurvedic medicine. Historical records are valuable for understanding past events and advancements in many fields. They provide insights into *Mutravahasrotas* and related health issues. A historical review looks at past events, trends, or developments within a specific time frame from different sources to understand *Mutrakricchram* better.

In medical literature, the history of UTI can be traced and described under two headings: the pre-antibiotic era and the post-antibiotic era. During the pre-antibiotic era, UTIs resulted in considerable morbidity. Hippocrates, in his writings about what appears to have been acute cystitis, noted that the illness could persist for a year before either improving or worsening to affect the kidneys. In the early twentieth century, when chemotherapeutic agents for treating UTI were introduced, they were relatively ineffective, and the recurrence of infection after three weeks of treatment was common. In the 1950s, nitrofurantoin became available as the first tolerable and effective agent for UTI treatment. Since the most common manifestation of UTI is acute cystitis, and acute cystitis is significantly more prevalent among women than men, the majority of clinical research on UTI has focused on women.

In Ayurveda, references regarding the description of Bastigata rogas, particularly Mutra rogas, can be observed from the Vedic period. The Atharva Veda, which serves as the foundation for Ayurveda, includes descriptions of the urinary organs such as Gavini, Basti, and Basti-Sira. Mutra expelled from Antra reaches the Basti through two tubular structures known as Gavini.

The information will be categorised under these headings:

- Vedic kala
- Purana kala
- Samhitha kala
- Sangraha kala
- Laghuthrayi
- Adhanika kala

## VEDIC KALA (6000-2500 BC)

History is the basis or part of anything in the world. Thus, learning more about Indian history, illness, and their cures has existed since the Vedic era. One of the oldest known written accounts on the same subject is thought to be the “Vedas”. Veda signifies knowledge, with the term itself originating from the root ‘vid’, which encompasses meanings such as “to know, to think, and to derive benefit from”. Understanding the world around us constitutes Veda, while the expansion of knowledge through contemplation and enquiry also falls under this definition. The main essence of Veda is to safeguard and conserve nature and the environment without causing any harm to living beings. There are 4 Vedas, in which, Atharvaveda is “a knowledge storehouse of Atharvanas, the procedure for everyday life”. According to the Rigveda, Maheshwara is regarded as the supreme healer among the gods, possessing the power to vanquish Bhoota, Pishach and Anos (disease-causing germs), highlighting the essential role of a Bhishak or healer.<sup>[1]</sup>

As part of the Atharvaveda (Upanga) or the Veda itself (Pancham Veda), Ayurveda places a strong emphasis on the idea of relieving suffering that has existed for ages. The knowledge about Mutravahasrotas and the disease affecting this system can be traced from the Vedic period to the present day.<sup>[2]</sup>

The Anatomy, Physiology and Pathology of Mutravahasroto Vikaras or Mutraroga have been described scientifically in Atharvaveda. Atharvaveda, being the foundation for Ayurveda, contains references like 'Gavini', 'Basti' and Basti-Bila. It encompasses physiological functions related to Dharana and Poshana. The use of Lohashalaka for urethral catheterisation to relieve a distended bladder has been described. In the Shaunika Shakha, one of the nine branches of Atharvaveda, medicinal substances with Mootrajanana (diuretic) and Ashmari hara properties are mentioned.<sup>[1]</sup> He has explained the importance of Pippali in treating urinary issues in *Pippali Aushadhi Adhyayam*. (Atharva Veda 6.109/1).

Additionally, the Kaushika Sutra, a significant text within the Atharvaveda, reference drugs with Mootrajanana (Pramehagna) effects. The Vedas serve as the foundation of human knowledge, offering comprehensive insights. Among the 4 Vedas, the Atharvaveda contains extensive information on health and diseases, including guidance on lifestyle, three Doshas and their management.<sup>[1]</sup>

According to Atharvaveda, to restore normal urinary flow, the obstruction must be removed, allowing the urethra to open and facilitate complete bladder emptying. Urine should be expelled in an uninterrupted stream, ensuring efficient voiding. The bladder outlet must remain unobstructed to prevent urinary retention or dysfunction. Just as an arrow is released from a bow in a smooth, forceful trajectory, so too urine should be expelled without resistance. (Atharvaveda 1.3/7-9).

In the topic regarding the cure of disease, he states that Chronic indigestion and pain are expelled from the body along with urine. (Atharvaveda 9.8/11).

#### **PURANA KALA (800-400 BC)**

The Garuda Purana, a renowned text, contains a detailed description of various diseases. It is one of the 18 Mahapuranas. The Poorvakandha section of the Garuda Purana presents the Dhanvantari Samhitha, which extensively discusses the pathology and symptoms of diseases as studied by ancient sages. The text systematically addresses the causes, incubation period, manifestations, progression, amelioration, localisation, diagnosis and treatment of diseases, making it highly significant from an Ayurvedic perspective. Notably, the Garuda Purana includes a dedicated chapter on Mutrakricchram, along with discussions on Mootravaha Srotas, the physiology of urine formation, and related urinary disorders. Similarly, the Agni Purana also contains references to Mutrakrichhram and associated conditions.

References to obstruction in the passage of urine can be found in Uttara Khanda of Valmiki Ramayanam.<sup>[1]</sup>

#### **SAMHITHA KALA (2000-600 BC)**

The Samhitha period is considered the golden era of Ayurveda, during which it was recognised as a scientifically and systematically developed system of medicine, and Acharyas contributed to the advancement and refinement of Ayurvedic literature.

The description of Mutravahasroto Vikaras, its anatomy, physiology and pathology perspectives are available in the Samhitas, including Charaka Samhitha, Sushruta Samhitha, Ashtanga Sangraha and Ashtanga Hridayam. However, there are certain slight differences in opinions on certain aspects.

### CHARAKA SAMHITHA

The Charaka Samhitha provides extensive knowledge about *Mutravaha Srotas*, including its root, *Nidanam*, *Samprapti*, *Bheda*, *Purvarupa* and *Chikitsa* across different Sthanas. It consists of 8 volumes and 120 chapters, was composed in the 8<sup>th</sup> century BC, and includes many commentaries.

Acharya has said its *Moola* has *Vasti* and *Vankshana*, and any pathology to this may lead to excessive urination, increased frequency and urgency with painful micturition. In the 4<sup>th</sup> chapter of *Sutrasthana*, Acharya has described *Mutrasangrahaneeeya*, *Mutaviranjaneeya* and *Mutravirechaneeya Mahakashayas*. Additionally, *Sutrasthana* elaborates on 8 types of *Mutraghata*, while in *Siddhithana*, 13 types of *Vastirogas* are explained under the heading *Mutra Dosha*, which closely resembles the *Mootraghata* described in *Sushruta Samhitha*.<sup>[3]</sup>

### SUSHRUTHA SAMHITHA

The Sushruta Samhitha is regarded as a pioneering text in surgery, and Acharya Sushruta is honoured as the Father of Surgery. Written between 600-700 BC, this text elaborates on the formation of urine along with its anatomy, physiology and pathology under *Ashmari Nidana*.

Acharya Sushruta considers *Pratiloma Vayu* or *Vata* as the primary cause of *Basti Vikaras*, including *Mutraghata*, *Mutrakricchram*, *Ashmari* and *Prameha*. In *Uttaratantra*, he has explained 12 types of *Mutraghata*.<sup>[4]</sup>

### SANGRAHA KALA (400 AD-1600 AD)

#### ASHTANGA SANGRAHA & ASHTANGA HRIDAYAM

Acharya Vagbhata composed the texts *Ashtanga Sangraha* and *Ashtanga Hridayam* in 400 AD. His works provide a comprehensive description and contribution to the understanding of diseases. While much of the information is reiterated from earlier *Samhitas*, it remains highly valuable. The detailed explanations regarding *Nidana*, *Bheda*, *Samprapti*, *Purvarupa*, *Lakshana* and *Chikitsa* make these texts exceptional. As *Ashtanga Sangraha* offers an extensive description, it holds significant importance in Ayurvedic literature.

In "*Mutraghata Nidana*", he has elaborated about *Mutrakrichhram* and *Ashmari Nidana* along with its *Chikitsa* in *Chikitsa Sthana* with some of the *Yogas* and *Panchakarma* procedure. Further, he has explained *Mutra-Atipravritijanya* and *Mutra-Apravritijanya Vikaras* at the end of the chapter, which includes all *Mutravaha Sroto Vikaras*.<sup>[5,6]</sup>

### VANGASENA

In *Mutrakricchra Adhyaya*, Acharya has explained the *Nidana*, *Samprapti*, *Rupam*, *Bheda* and its *Chikitsa* along with *Shodhanam* and *Shamana oushadhis*.<sup>[7]</sup>

### GADANIGRAHA

The anatomy, physiology and pathology of *mutravahasrotas* have been explained in this book.<sup>[8]</sup>

**BASAVARAJEEYAM**

In the 6<sup>th</sup> chapter, *Vataroganidanalakshanachikitsaadhyaya*, he has described *Bastivata*, *Mutrabandha Vata*, where *Mutrakrichhram* is mentioned as a symptom and in the 3<sup>rd</sup> chapter, he has elaborated on Urine examination, *Tailabindhu Pareeksha* and its diseases based identification along with predominance of *Doshas*.<sup>[9]</sup>

**YOGARATNAKARA**

He has dedicated a separate chapter to *Mutrakrichhram*, clearly detailing its *Nidana*, *Samprapti*, *Lakshanam* and *Chikitsa* along with specific *Yogas* and guidelines on *Pathya* and *Apathyam*.<sup>[10]</sup>

**HARITA SAMHITHA**

Acharya only provided the general management approach for *Mutrakrichhra*, without mentioning the types of *Mutrakrichhra* or its treatment.<sup>[11]</sup>

**YOGATARANGINI**

The chapter on *Mutrakrichhram* is documented in this textbook<sup>12</sup>. (Y.T. 48/2. Pg 285).

**RASENDRASARA SANGRAHA**

In the 2<sup>nd</sup> Chapter, *Mutrakrichhra Adhyaya*, he has described various *Rasa* compounds that can be used for *Mutrakrichhram*. Additionally, he has dedicated specific chapters for *Mootraghata* and *Ashmari*.<sup>[13]</sup>

**BHELA SAMHITHA**

*Bhela*, regarded as the second disciple of *Punarvasu Artreya* composed *Bhela tantra* which later evolved into *Bhelasamhita*. Though the exact period of origin remains unknown, it is believed to have existed before the 5<sup>th</sup> -6<sup>th</sup> century A.D. the text available from the medieval period, consists of eight *Sthanas* and 107 chapters. In the *Chikitsasthana*, specifically in the 12<sup>th</sup> chapter, *Bhela* has elaborated on the treatments for *Mutrakrichhram*, *Mootraghata* and *Ashmari*.<sup>[14]</sup>

**BHAISAJYA RATNAVALI**

In chapter 34, Acharya has elaborated *Mutrakrichhra Adhyaya*, detailing its treatment, including *Sodhanam*, *Shamanam* and specific therapeutic *Yogas*.<sup>[15]</sup>

**CAKRADATTA**

*Chikitsa Sangraha*, a renowned classical text of Ayurveda, was authored by *Chakrapanidatta* in the 11<sup>th</sup> century A.D. It comprises 79 chapters, with *Mutrakrichhra* discussed in the 32<sup>nd</sup> chapter. In this chapter, he has detailed its treatment, including specific *Yogas*, *Shodhana*, *Shamana* and guidelines of *Pathya* and *Apathya*.<sup>[16]</sup>

**KASHYAPA SAMHITHA**

The original *Kashyapa Samhitha* was composed between 600 BC - 200 A.D; however, the currently available version dates back to the 11<sup>th</sup> to 13<sup>th</sup> century A.D.

In chapter 25, while detailed explanations are limited, the text mentions the essential characteristics of *Mutrakrichhram*.<sup>[17]</sup>

**LAGHUTRAYEES****SHARANGADHARA SAMHITHA**

This text is a compilation from the late 13<sup>th</sup> century to the early 14<sup>th</sup> Century A.D, consisting of 32 chapters and 2600 *Slokas*. It includes a description of *Yogas* that can be used for the treatment of *Mutrakricchram*.<sup>[18]</sup>

**MADHAVA NIDANA**

Madhavkara has explained *Mutrakricchram*, *Mutraghata* and *Ashmari* in separate chapters with the same description as *Charaka* and *Sushruta*. He has differentiated *Mutrakricchram* and *Mutraghata* on the basis of *Krucchratva* and *Vibandata*.<sup>[19]</sup>

**BHAVAPRAKASHA**

Bhavmisra, the author of *Bhavaprakasha*, composed the text in the latter half of the 15<sup>th</sup> century A.D. It is divided into 3 *khandas* (*Purva Khanda*, *Madhyama Khanda* and *Uttara Khanda*). In *Madhyama Khanda* 35<sup>th</sup> Chapter, *Mutrakricchra Adhikara* is discussed, where he elaborates on the *Nidana*, *Samprapti*, *Lakshana* and *Chikitsa* for various types of *Mutrakricchram* along with specific *Yogas*.<sup>[20]</sup>

**THE RISE OF MODERN UROLOGY**

Urinary tract infections (UTIs) have been recognised for thousands of years, with historical medical texts describing symptoms and treatments long before the advent of modern medicine. Humans have suffered from UTIs long before the discovery of bacteria as disease-causing agents and the establishment of urology as a medical speciality. There is no comprehensive review of the recorded medical history of UTIs, from their earliest mention in ancient Egyptian papyri to the present, that has been conducted until now.

**ANCIENT TIMES****Egypt**

The symptoms of UTIs were recorded as early as 1550 BC in the Ebers Papyrus, an ancient Egyptian medical text that described 900 diseases and described excessive urination, painful urination and recommended herbal remedies.<sup>[21]</sup>

**Greece**

In ancient Greece, patients sought healing from Asklepios in his temples, where the god was believed to cure ailments, or priests would prescribe treatments based on divine instructions. Over time, these temples evolved into the medical schools of Cnidos, which specialised in classifying diseases according to symptoms, affected body parts, and prognosis. Cnidian physicians employed a wide range of medicinal treatments and were recognised for their pioneering, though sometimes hazardous, surgical techniques. A medical text associated with the Cnidian school, about inner sufferings, details four renal diseases such as Renal Pthisis (likely Renal tuberculosis), Nephrolithiasis, Renal vein thrombosis or papillary necrosis and Acute renal infection. In all of these, most of the UTI symptoms like lower abdominal pain, dysuria, frequent urination and fever are seen.<sup>[22]</sup>

In ancient Greece, Hippocrates (460-370 BC) was considered to be the father of clinical medicine and one of the important figures in Greek medicine. By integrating the medical knowledge of the Cnidian school with his perspective, he viewed disease both as a natural occurrence and a form of divine retribution. Hippocrates laid the groundwork for scientifically based, evidence-driven medicine. His complete work is known as the Hippocratic collection, which

includes discussion on various urinary ailments, such as kidney disorders, calculus disease and strangury - a condition characterised by slow, painful urination in small amounts.<sup>[23]</sup>

Hippocrates believed that calculus disease developed when sand particles present in consumed water merged. While these particles are typically expelled through urine, certain conditions, such as partial urethral obstruction or increased bladder temperature, can promote their accumulation into stones, leading to disease progression. He identified 5 key signs and symptoms of the condition, some of which were likely linked to urinary tract infections: dysuria, Hematuria, strangury, bladder inflammation and presence of sand in urine. Instead of advocating for routine surgical removal of stones, Hippocrates preferred medical treatments. In Hippocratic terminology, strangury refers to difficulty urinating or urine retention, which results from inflammation of the rectum or womb, or an infection in the kidney. He has explained 5 diseases related to the kidneys, in which he finally explained about UTI and cystitis. The syndrome is attributed to bile and phlegm, particularly in the summer, as well as excessive sexual activity. Symptoms include pain in the lower back and flanks, dysuria, cloudy urine and occasional hematuria. The condition is said to persist for about a year, after which it may either improve or progress to affect the kidneys.<sup>[24]</sup>

### **Rome**

The Cnidian school of medical science got declined after the death of Hippocrates, while the city of Alexandria grew to become the centre of scientific medicine. Celsus (25 BC to 40 AD) compiled an important textbook named *De Re Medica*, in which several diuretic herbs were used in combination with other treatments. After the death of Celsus, physicians like Aretaeus of Cappadocia (81-138 AD), Rufus of Ephesus (98-117 AD) and Galen (131-200AD). Rufus of Ephesus wrote the first textbook on Urology of that era. Later, the Roman physician Galen (129-216 CE) attributed UTIs to an imbalance in bodily humours, a widely accepted medical theory of that era.<sup>[25]</sup>

### **Middle East**

Aetius of Amida, born in 543 AD, gave a comprehensive account of uroscopy, highlighting its role in diagnosis and prognosis. The examination of urine focused on its clarity, colour, odour, cloudiness and the presence of sediment or blood. This practice remained widespread across Europe for several centuries, continuing until the Renaissance.

Avicenna (980-1037) was one of the most important Middle Eastern physicians who wrote the book named *Canon Medicae*, which became the famous book of that century. He has described many Renal conditions along with dysuria and hematuria.<sup>[26]</sup>

### **MEDIEVAL AND RENAISSANCE PERIODS**

Bernard de Gordon (13<sup>th</sup> Century), in his book *Lilium Medicinae*, classified Bladder diseases as urine retention, strangury or dysuria and explained treatments like bleeding and enemas.

Anatomy and surgical methods advanced significantly throughout the Renaissance (c. 1500–1750). However, no novel, efficient treatments were developed, and the fundamental causes of illnesses were still unknown. The 19th century saw significant medical improvements, yet personal cleanliness and public health were also mainly disregarded<sup>[27]</sup>.



## 19<sup>th</sup> CENTURY AD

The most important medical discovery of the 19th century was the identification of bacteria as the cause of infections. Ignaz Semmelweis and Joseph Lister demonstrated in the 1850s that antiseptic procedures could aid in the decrease of infections.

Urinary tract infections (UTIs) are caused by *Escherichia coli* (*E. coli*), which was discovered in 1882 by the German microbiologist Karl Petruschky. Urinalysis improved, using microscopes to find pus and germs in urine.<sup>[28]</sup>

## 20<sup>th</sup> CENTURY: THE REVOLUTION OF ANTIBIOTICS

Important medical advancements, such as the 1928 discovery of penicillin by Alexander Fleming, the 1930s invention of sulfonamides, and the 1950s introduction of nitrofurantoin, revolutionized the treatment of urinary tract infections (UTIs). In the middle of the 20th century.

The widespread use of antibiotics has reduced complications and mortality rates dramatically. Methenamine and other urinary antiseptics were launched. Improved prevention and treatment were made possible by improved hygiene habits and advances in diagnostics, such as urine cultures.<sup>[29]</sup>

## CURRENT TIMES: ANTIBIOTIC RESISTANCE AND UPCOMING DIFFICULTIES

Urinary tract infections (UTIs) were still one of the most common bacterial diseases during the late 20th and early 21st centuries, although antimicrobial resistance was becoming a serious problem.<sup>[30]</sup>

## EVOLUTION OF ANTIMICROBIAL THERAPY FOR UTI

Multi-drug-resistant (MDR) infections and resistant strains of *E. coli*, like ESBL, have made treating urinary tract infections (UTIs) more challenging. Early antibiotic treatments faced issues with side effects and effectiveness. A truly safe and effective antibacterial solution wasn't available until the 1950s, marking a key development in UTI treatment, though better diagnostics and non-drug methods remain important. In the early 20th century, medications like Hexamine and Mercurochrome showed limited success.<sup>[31]</sup>

New treatment options now include probiotics, vaccines, and phage therapy, along with alternative approaches such as immunotherapy, cranberry extracts, and D-mannose. An international conference on antimicrobial resistance (AMR) was held in February 2016 by the Government of India and the WHO, highlighting AMR as a serious public health challenge. In India, the mortality rate from infectious diseases is 417 per 100,000 people, suggesting a strong impact from AMR.<sup>[32]</sup>

AMR occurs as microorganisms evolve and resist treatments, complicating infections and increasing the risk of severe illness and death. This issue leads to ineffective treatments and persistent infections, raising concerns about the potential for transmission. The effects of AMR are significant, with almost 5 million deaths yearly from resistant infections. Improved vaccine use could significantly reduce antibiotic use, according to the WHO.<sup>[33]</sup>

## CONCLUSION

The understanding of Urinary Tract Infections has grown tremendously—from the early descriptions found in ancient texts to the detailed biomedical explanations of today. Ayurvedic classics identified conditions similar to UTI under *Mutrakrichhra* and *Mutraghata*, highlighting the role of doshic imbalance, diet, and lifestyle. Over time, the approach



to UTI has shifted from symptom-based management and herbal therapies to recognising microbial causes, using antibiotics, and developing preventive care. However, challenges such as antimicrobial resistance and recurrent infections continue to persist. These issues remind us of the value of combining traditional wisdom with modern scientific insights. Overall, the historical journey of UTI underscores the importance of adopting holistic, safe, and sustainable treatment strategies that bring together both Ayurveda and contemporary medical practice.

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