

**STUDY OF PATHOGENESIS AND ITS SENSITIVITY PATTERN IN UTI**Rajendra Prasad Kathula<sup>1</sup>, Chakrapani Alavala<sup>2</sup><sup>1</sup>Associate Professor, Department of General Surgery, Government Medical College, Nizamabad.<sup>2</sup>Associate Professor, Department of General Surgery, Government Medical College, Nizamabad.**ABSTRACT****BACKGROUND**

Urinary tract infections are common causes of both community acquired and nosocomial infections in adult patients admitted in the hospitals. Urinary tract infections can be defined as the presence of pathogenic bacteria in significant colony count in the bladder of upper urinary tract with its associated consequences. Asymptomatic bacteriuria is a term used to designate urinary tract infections in the absence of symptoms with the growth of bacteria colonies often crossing 1,00,000/mL in a freshly voided midstream urine sample. Urethritis and cystitis are characterised by the inflammation of the urethra and bladder with symptoms of dysuria, frequency and lower pubic pain and it is associated with fever. Acute pyelonephritis is the bacterial infection of renal parenchyma and it is characterised by fever with rigors, flank pain, vomiting, costovertebral tenderness with or without symptoms of cystitis. It may be associated with pus formation. Prostatitis is quiet common and it involves infective inflammation of the prostate associated with dysuria, urgency, frequency and pain in the lower abdomen, perineum, or base of the penis. A sincere effort has been made towards this study on pathogenesis and its sensitivity pattern in UTI.

**METHODS**

One hundred cases who visited the Department of Surgery, Government Medical College, Nizamabad were used as the sample size of the study. The plethora of the signs and symptoms which were seen were noted and the mid catch of the urine was done and sent to the Department of Microbiology for the pathogens to be identified. The sensitivity pattern was also studied and reported. The study was done from October 2012 to November 2013.

**RESULT**

The most common pathogen was E. coli and the most sensitivity of the commonest pathogen (E. coli) was found to be towards Nitrofurantoin.

**CONCLUSION**

In this study, the most common pathogens which causes the UTI and the sensitivity pattern has been reported. The study is intended to help the practising surgeons, urologists and nephrologists to understand the common UTI causing pathogens and the sensitivity patterns. There might be a geographical variation and the study may form a base for further studies in different locations so that the study can actually help in all parts of the country without any doubts.

**KEYWORDS**

Urinary Tract Infections, Pathogens, Culture, Sensitivity.

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**INTRODUCTION:** Urinary tract infections are common causes of both community acquired and nosocomial infections in adult patients admitted in the hospitals. Urinary tract infections can be defined as the presence of pathogenic bacteria in significant colony count in the bladder of upper urinary tract with its associated consequences. Asymptomatic bacteriuria is a term used to designate urinary tract infections in the absence of symptoms with the growth of bacteria colonies often crossing 1,00,000/mL in a freshly voided midstream urine sample. Urethritis and cystitis are characterised by the inflammation of the urethra and bladder with symptoms of dysuria, frequency and lower pubic pain and it is associated with fever.

Acute pyelonephritis is the bacterial infection of renal parenchyma and it is characterised by fever with rigors, flank pain, vomiting, costovertebral tenderness with or without symptoms of cystitis. It may be associated with pus formation. Prostatitis is quiet common and it involves infective inflammation of the prostate associated with dysuria, urgency, frequency and pain in the lower abdomen, perineum, or base of the penis. The outer one-third of the female urethra, the urinary tract is normally sterile.<sup>1</sup>

Urinary tract infection includes both asymptomatic microbial colonisation of the urine and symptomatic infection.<sup>2</sup> Colony counts of >10<sup>5</sup>/mL of midstream urine are occasionally due to specimen contamination, which is especially likely when multiple species are found.<sup>3</sup> Urinary tract infections can be first infections, unresolved bacteriuria during the drug therapy, recurrent urinary infections which can be a re-infection or relapse. In first infections, urinary tract infection does not generally occur in adult males, the patient should be thoroughly investigated after treatment of the infection.

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However, if a history of STD is obvious, detailed investigation may not be indicated. In the adult females as UTI is relatively common detailed investigations are undertaken only if there is failure to eradicate infection or recurrent infections occur. Unresolved bacteriuria during therapy failure to eradicate the infection during therapy may be due to many causes. If the organism is not sensitive to the chosen antibiotic, therapy may not be effective. Rapid development of bacterial resistance, mixed infections, renal failure, papillary necrosis, staghorn calculus and rapid re-infections are the causes of unresolved bacteriuria during therapy. Proper dose, duration and compliance of the drug must be ensured before confirming unresolved bacteriuria. Relapse is the recurrence of bacteriuria with the same infective microorganism.

It may be symptomatic or asymptomatic. Causes of relapse include staghorn calculus, papillary necrosis, foreign bodies, chronic bacterial prostatitis; congenital anomalies of the urinary tract, fistulas and renal failure. Re-infection indicated recurrence of the infections with the different organisms. Most cystitis and urethritis are due to re-infections. The disease exceeds in frequency among ambulatory patients only by respiratory and gastrointestinal infections.<sup>4</sup> Every female has a 20% life time risk of coming down with a UTI.<sup>5</sup> In children, approximately 5% of girls and 1% of boys get UTI by 11 years of age.<sup>6</sup> UTI is suspected on the basis of symptoms mainly involving the lower urinary tract like frequency, dysuria, haematuria, urgency or strangury. In the upper tract infection, fever, vomiting, vague abdominal pain or costovertebral tenderness may be the other symptoms.

For establishment of the diagnosis, it is essential to demonstrate bacterial colony of less than 10 (1,00,000 organisms/mL) of urine in a clean catch. MSU sample or any growth seen on the urine sample obtained by suprapubic bladder aspiration or by catheterisation. With haematogenous spread, the patient may be acutely ill with features suggestive of abscess formation and septicaemia. In diabetics, severe blood stream, infection may produce necrotising papillitis and acute renal failure. A proper clinical examination includes per rectal examination for prostatic enlargements and tenderness in the males and speculum examination of cervix and vagina in females. Appropriate investigations are carried out to establish the diagnosis, identify the level of infections and look for predisposing causes.

A single most important investigation would be full urine examination including routine and culture and antibiotic sensitivity particularly in recurrent infections. Presence of pus cells in routine urine testing would indicate inflammation of the urinary tract but its ineffective aetiology has to be established by proper culture to identify the bacteria. USG is used for initial scrutiny in recurrent UTIs to detect any structural abnormalities in the urinary tract.

In sexually active females with recurrent UTIs, the disease can be prevented by good perineal hygiene, emptying of the urinary bladder before and after intercourse, single dose cotrimoxazole immediately after intercourse.

The treatment includes general measures like adequate fluid intake which helps frequent voiding of the bladder, use of urinary analgesics like phenazopyridine hydrochloride for symptomatic relief. Increased fluid intake, diuresis, aid flushing of bacteria, reduces irritation and decreases the hyperosmolarity of the medulla. Specific drug therapy whether it is the first episode of UTI or recurrent infection. In acute infection, single dose therapy amoxicillin 500 mg, cotrimoxazole 2 tablets or doxycycline 200 mg affects cure in 80% of the cases of lower urinary tract infection.

This dose is two to three times of the therapeutic dose. Occurrence of the relapse in the remaining 20% suggests acute pyelonephritis or prostatitis in young males. Treatment with appropriate antibacterial agents depends on urine culture sensitivity. The treatment is given for 10 to 14 days. Cases with frequent relapses should be treated for six weeks. In pregnant females, only aminopenicillins and cephalexin are permissible in the first trimester, following initial full dose treatment, suppressive therapy with single nightly dose will have to be carried out till term. All patients with recurrent infections will need appropriate radiological evaluation with intravenous pyelogram, ascending pyelogram and urodynamic evaluation depending on the appropriate clinical diagnosis of the underlying condition.

Final cure involves appropriate management of underlying conditions. Antibacterial agents which concentrate in prostatic tissue like cotrimoxazole, quinolones or erythromycin are used in the treatment of prostatitis. Aminoglycosides are used in fulminant cases. Complete eradication from the prostatic tissue may yet at times need prolonged treatment for twelve days. Many a times in young couples, both partners need to be monitored and treated to avoid from each other. It is also the most common cause of nosocomial infections in adults.<sup>7</sup> If asymptomatic bacteriuria is detected in diabetics, children, immunity lacking persons or during pregnancy should be treated. High clinical acumen, perseverance and diligent search for underlying cause and adequate therapy form cornerstones in recurrent tract infections.

#### **AIMS AND OBJECTIVES:**

The aim of the study is to

1. Find the pathogens causing the urinary tract infection.
2. Find the sensitivity pattern of the pathogens.

**MATERIALS AND METHODS:** One hundred cases who visited the Department of Surgery, Government Medical College, Nizamabad were used as the sample size of the study. The plethora of the signs and symptoms which were seen were noted and the mid catch of the urine was collected and sent to the Department of Microbiology for the pathogens to be identified. The sensitivity pattern was also studied and reported. The study was done from October 2012 to November 2013.

**Inclusion Criteria:**

1. Age of the patients between 20 to 50. This was done to prevent the age bias.
2. Confirmed cases of UTI were included.

**Exclusion Criteria:**

1. <25 years and > 50 years were excluded.
2. Any pre-existing urinary tract malformations were not included in the study.
3. Patients who were under immunosuppressant drugs were not included in the study.

Organism	Frequency	Percent
E. coli	52	52%
S. aureus	31	31%
S. faecalis	11	11%
Pseudomonas	2	2%
S. pyogenes	3	3%
S. albus	1	1%
<b>Total</b>	<b>100</b>	<b>100.0</b>

**Table 1: Frequency of Pathogens in UTI**

		E. coli	S. aureus	S. faecalis	Proteus spp.	Pseudomonas
Amoxicillin	Sensitive	19%	62%	71%	38%	0%
	Resistant	81%	38%	29%	62%	100%
Augmentin	Sensitive	38%	79%	72%	63%	0%
	Resistant	62%	21%	28%	37%	100%
Ofloxacin/Ciprofloxacin	Sensitive	70%	80%	76%	81%	59%
	Resistant	30%	20%	24%	19%	41%
Gentamicin	Sensitive	58%	67%	31%	48%	34%
	Resistant	42%	33%	69%	52%	66%
Nalidixic Acid	Sensitive	40%	21%	22%	31%	19%
	Resistant	60%	79%	78%	69%	81%
Nitrofurantoin	Sensitive	72%	55%	45%	34%	22%
	Resistant	28%	45%	55%	66%	78%
Cotrimoxazole	Sensitive	44%	19%	19%	21%	16%
	Resistant	56%	81%	81%	79%	84%
Tetracycline	Sensitive	32%	24%	42%	8%	09%
	Resistant	68%	76%	58%	92%	91%

**Table 2: Antibiotics Sensitivity Pattern (To Different Organisms)**

**DISCUSSION:** Common microorganisms responsible for UTI are Gram-negative Enterobacteriaceae, E. Coli, being the most commonly isolated organism in the acute infections. However, Klebsiella species and certain Gram-negative nonfermenting bacteria are encountered in hospital-acquired infections. Proteus group of organisms are commonly seen in presence of calculous disease of the urinary tract. Pseudomonas aeruginosa is seen in special urological situations following catheterisation or instrumentation of urinary tracts or nosocomial infections that are acquired from the hospitals. The common aetiopathogenic factors include anatomical abnormalities of the urinary tract in adults like meatal stenosis, bladder outlet obstruction due to urethral structures or enlarged prostate.

Pelviureteric anomalies, vesicoureteric reflux, medullary sponge kidney with calcosinosis, renal tubular acidosis, functional abnormalities resulting from bladder dyskinesia, bladder detrusor sphincter dysynergia and neurogenic bladder are some of the congenital causes responsible for recurrent UTI.

Common acquired causes include obstruction due to stones, tumours, uterine prolapse, vesicovaginal fistula, cervicitis and vaginitis in females. In the group of female patients with idiopathic recurrent UTIs where there are no abnormalities of the urinary tract, a number of host factors and bacterial virulence properties have been identified.

The organisms come from the bacterial flora of the perineal region by ascending infection due to the close proximity of the anal canal and the urethra. They may come from foci of sepsis in the upper respiratory tract, orodental and cardiopulmonary regions through the blood stream. Any obstruction to the urinary passage distal to the bladder allows the bacteria that have ascended up an opportunity to travel further upwards from the bladder to the ureters and the kidney due to high pressure in the system, leading to the reflux of bladder urine into the ureters. In young, sexually active females, trauma, during intercourse can result in the ascent of infections to the bladder. In pregnant females, dilated ureters due to the hormonal influences and pressure of the gravid uterus enables the bacteria to travel from the bladder to the kidney.

The growth of the bacteria depends on the host factors as well as the microbial factors. Most factors include availability of microbial receptors, sites on the uroepithelium, secretory state resulting from loss of secretory IgA due to bladder inflammation and presence of Tamm Horsfall protein in the urine. Microbial factors include capacity to adhere to the uroepithelium and presence of fimbriae of the bacteria in the absence of glucose are inhibitory to the bacterial proliferation. Presence of glucose in the urine as in diabetic subjects and low levels of urine are as seen in presence of renal failure are seen to be conducive to the growth of

bacteria. Spread to the upper tract is facilitated by the reflux from the bladder.

Vesicoureteric reflux and reflux into the connecting ducts that is intrarenal reflux; these two factors have an important role in the causation of pyelonephritis. Some nonbacterial organisms can also cause UTI in special situations. Chlamydia trachomatis and Mycoplasma hominis may cause urethral syndrome. Fungal infections supervene in subjects with longstanding urinary catheters and in prolonged antibiotic therapy in immunocompromised hosts as seen in subjects with malignancies following organ transplantations as they will be under steroid therapy so that the host will not react towards the new attachment which is foreign.

**CONCLUSION:** In this study, the most common pathogens which cause the UTI and the sensitivity pattern has been reported. The study is intended to help the practising surgeons, urologists and nephrologists to understand the commonly UTI causing pathogens and the sensitivity patterns. There might be a geographical variation and the study may form a base for further studies in different locations so that the study can actually help in all parts of the country without any doubts.

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