

# FREQUENCY OF URINARY TRACT INFECTION (UTI) & COMMONEST CAUSATIVE ORGANISMS IN SPINAL CORD INJURY PATIENTS WITH VARIOUS VOIDING MODES

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## ABSTRACT

**Objective of study:** To determine the frequency of urinary tract infection and commonest causative organisms in spinal cord injury patients with various modes of voiding in rehabilitation setup in Pakistan.

**Design:** A descriptive study of 100 spinal cord injury patients.

**Setting:** This study was carried out in Armed Forces Institute of Rehabilitation medicine (AFIRM) Rawalpindi from 15 September 2007 to 15 March 2008 on clinical samples received from admitted patients in CMH Rawalpindi and AFIRM.

**Material and Methods:** In 100 patients of spinal cord injury after history and detailed physical examination blood samples were collected for (TLC) Total Leucocytes Count and urine samples were subjected to Urine RE and Urine C/S. Urine culture revealing a bacterial colony count of 10<sup>5</sup> cfu/ml or higher were considered positive for urinary tract infection (UTI) if present with symptoms. Significant bacteriuria was investigated for spectrum and sensitivity pattern as well.

**Results:** Of all 100 spinal cord patients 52 patients (52%) had symptoms suggestive of UTI but only 37 patients (37%) had significant bacteriuria on urine culture supported by high level pyuria were declared to have UTI. E-coli was the most commonly isolated organism with total no of 20 cases (54.1%) followed by Pseudomonas total no of 6 cases (16.2%), Klebsiella pneumoniae with total no of 3 cases (8.1%), Proteus mirabilis with total no of 3 cases (8.1%), Citrobacter freundii with total no of 2 cases (5.4%) and the least frequent was Morganella morganii with 1 case (2.7%). UTI was most frequent in patients with Indwelling catheter and was least associated with self voiding.

**Conclusion:** Urinary Tract Infection was commonly observed among spinal cord injury patients. E-coli was the commonest isolated pathogen followed by Pseudomonas, Klebsiella pneumoniae, Proteus mirabilis, Citrobacter freundii, Candida and Morganella morganii in descending order of frequency. UTI was most frequent in patients using Indwelling catheter as a mode of voiding.

**Keywords:** Spinal cord injury, Urinary tract infection, significant bacteriuria.

## INTRODUCTION

Urinary tract infection (UTI) is the single most frequent, secondary medical complication in persons with spinal cord injury (SCI) who develop neurogenic bladder irrespective of the type of bladder management used<sup>1</sup>. UTIs affect the overall well being in these individuals contributing substantially to health care costs. Spinal cord injured patients who have neurogenic bladder cannot have normal physiologic voiding and require catheterization for bladder drainage and prevention of urologic complications. Although renal failure is not the major problem at present, urinary tract

infection still remains troublesome. When host defenses are seriously compromised by defective bladder emptying, presence of a urinary catheter, vesicoureteric reflux or stones then the individual is likely to be susceptible to virtually any organism that can invade the urinary tract<sup>2</sup>. Neurogenic bladder is at the risk of UTI for several reasons such as bladder distension and elevated detrusor pressure which cause loss of immunity and decreased wall movement of bladder<sup>3</sup>. Detrusor overactivity and detrusor sphincter dyssnergia lead to urinary stasis and turbulence in the proximal urethra. Other predisposing factors include impaired bladder emptying, repeated instrumentation, vesiculoureteric reflux, and indwelling urinary catheters<sup>4</sup>. Bacteriuria is a problem almost universal in patients with vesico-sphincter dysfunction, and is often

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associated with the use of catheters as a method of bladder emptying<sup>5</sup>. The diagnosis of UTI is usually made based on the presence of signs and symptoms and confirmed by culture examination with significant bacteriuria supported by high level pyuria. Invariably neurogenic bladder is dependant on catheter indwelling or intermittent for drainage but indwelling urinary catheter is virtually always associated with bacteriuria with in a few days after it is inserted as a safe drainage method but Intermittent catheterization (IC) has become a mainstay in the care of patients with SCI who have adequate hand function or a willing health care provider. It is favored mainly because of evidence that it decreases the incidence of UTI and urologic complications<sup>6</sup>. In addition to standard uncoated polyethylene catheters, the market today provides hydrophilic-coated catheters. It is hypothesized that the hydrophilic catheters may cause fewer UTIs than standard catheters<sup>7</sup> Increased susceptibility to the UTI in SCI patients with various modes of voiding indicates that normal volitional voiding, crede maneuver, reflex voiding carries least chance of UTI while there is increase risk associated with indwelling catheter and suprapubic cystostomy. However IC is safe midway option associated with fewer complication and UTI episodes. In most of the international study predominant etiologic agent of UTI in SCI was E-coli followed by other enterobacters, such as *Klebsiella pneumoniae* and *Proteus mirabilis*<sup>8</sup>. Patients with SCI are also prone to the development of bladder and renal stones. One link between chronic bacteriuria and the formation of stones is infection of the urinary tract with urease-producing organisms including *Klebsiella*, *Providencia*, *Morganella*, and *Proteus*. UTI in neurogenic bladder can result in epididymitis, orchitis, penoscrotal abscess, penoscrotal fistula bladder stones and cancers. This can also complicate upper urinary tract and result in pyelonephritis hydronephrosis, renal stones, renal scarring, renal function deterioration which can cause chronic renal failure<sup>9,10</sup>. Studying the local spectrum and sensitivity of causative organisms and characterizing safest

mode of drainage will not only help in reducing the disease burden but also ensure prompt and early rehabilitation.

## **MATERIAL AND METHODS**

This Descriptive study was carried out at Armed Forces Institute of Rehabilitation Medicine (AFIRM) Rawalpindi from September 2007 to March 2008. A total of 100 patients with acute and chronic spinal cord injury were selected:

### **Inclusion criteria**

Male and female patients of all ages with acute or chronic spinal cord injury.

### **Exclusion criteria**

Patients receiving any type of immunosuppressive therapy or suffering from immune deficiency disorder to avoid the bias of increased susceptibility of infection.

### **Data collection procedure**

One hundred patients of spinal cord injury were included in the study, data was collected from each of the 100 SCI selected patients for a period of 6 months (September 2007 to March 2008) regarding the age ,occurrence of symptoms of urinary infection, and method of urinary drainage system including the actual procedure of urethral catheterization. Urine samples of all these patients were taken and routine examination & culture was done. A blood sample was sent for TLC count in each case. Method of collection of data was observational using TLC, urine RE and urine culture and sensitivity. In the present study, UTI was defined as to be present if the patients had sign and symptoms of UTI and urine C/S revealed a bacterial colony count of 10<sup>5</sup> (cfu/ml of urine) or higher .

### **Statistics Analysis**

All the data regarding demographical, clinical details, microbiological and biochemical parameters was registered and compiled for statistical analysis using SPSS version 10.0. Mean and SD was calculated for numerical variable i.e. age, frequency and percentage were calculated for categorical variables i.e. gender, urine R/E, C/S and mode of voiding.

## RESULTS

Of 100 spinal cord injured patients, there were 90 males and 10 females, with the age ranging from 12 to 67 yrs, with a mean age of  $41.3 \pm 28.3$  years. In this study out of 100 patients 52 patients (52%) had symptoms suggestive of UTI but only 37 patients (37 %) having significant bacteriuria on urine culture supported by high level pyuria in routine urine examination, were declared to have UTI. Eleven (11%) had insignificant bacteriuria and 52 (52%) showed no growth on urine culture. Of 37 patients with significant bacterial growth, *Escherichia coli* was the most commonly isolated organism with total no of 20 cases (54.1%) followed by *Pseudomonas aureginosa* with 6 cases (16.2%), *Klebsiella pneumoniae* 3 cases (8.1%), *Proteus mirabilis* 3 cases (8.1%), *Citrobacter freundii* 2 cases (5.4%) *Candida* 2 cases (5.4%) and *Morganella morganii* 1 case (2.7%). (Table 2). Most gram-negative bacteria were susceptible to amikacin and third-generation cephalosporins. Frequency of UTI was calculated in different modes of voiding urine and it was found that out of 37 patients with UTI 20 (54.05%) had indwelling catheter, 15 (40.5%) were using clean intermittent catheterization (IC), 1 (2.7%) was using Crede maneuver to void urine, and 1 (2.7%) had suprapubic cystostomy, while no patients with reflex voiding and urinary continence had UTI, showing that UTI was more frequent in SCI patients using catheterization as mode of voiding but more in indwelling catheterization as compared to IC, proving safety of use of IC in neurogenic bladder.

## DISCUSSION

The annual worldwide incidence of spinal cord injury (SCI) is approximately 40 per million persons. Asymptomatic bacteriuria is common (70%) in SCI patients under catheterization, with urinary tract infection (UTI) the most frequent complication. Patients with SCI are also prone to the development of bladder and renal stones and cancers. UTI is still one of the leading causes of morbidity in SCI<sup>11,12</sup>. UTI is traditionally considered by the presence of 100,000 or more bacteria/ml in

urine<sup>13</sup>. Because of loss of sensation, patients with SCIs do not have the common symptoms of urinary tract infection such as frequency, urgency, and dysuria. The clinical features of UTI may include fever, pyuria, and other "soft" symptoms and signs such as discomfort over the back or abdomen during urination, onset of incontinence, increased spasticity, autonomic hyperreflexia, malaise, lethargy, or observation of cloudy urine with increased odor<sup>14</sup>. This study showed that in 100 SCI patients during a study period of 6 months, frequency of UTI was 37. This result is consistent with other international studies, which also document a high frequency and prevalence of UTI in SCI patients. Siroky MB. Et al and Garcia Leoni ME et al. revealed in their studies that urinary tract infection (UTI) is a very common complication in persons with SCI with a high frequency and prevalence<sup>15,16</sup>. *Escherichia coli* is generally considered to be the most common cause of UTI and *Staphylococcus saprophyticus*, *Proteus mirabilis*, *Streptococcus agalactiae*, and *Klebsiella* spp. are responsible for most of the remaining cases<sup>17</sup>. In contrast, complicated UTIs, in which a predisposing factor is present concomitantly, are caused by a much wider variety of organisms<sup>18</sup>. In this study as well it was seen that in our rehabilitation setup UTI is frequent in spinal cord injury patients and *E. coli* is the most common causative pathogen followed by *Pseudomonas aureginosa*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Citrobacter freundii*, *Candida* and *Morganella morganii*. Most gram-negative bacteria were susceptible to amikacin and third-generation cephalosporins, these results are consistent with other international studies. E. Hernández Fernández et al in his study<sup>19</sup> reported that the etiologic agent predominant in UTI with SCI was *E. coli*, found in 60% of cases and followed by other organisms such as *K. pneumoniae* and *P. mirabilis* mainly, there were not remarkable differences in uropathogens when it was compared with UTI but, without SCI as in other reports<sup>8</sup>. In this study a total of 37% had UTI out of 37 patients 20 (54.05%) had indwelling catheter, 15 (40.5%) were using clean intermittent catheterization (CIC), 1 (2.7%) was

using Crede maneuver to void urine, and 1 (2.7%) had suprapubic cystostomy, while no patients with reflex voiding and urinary continence had UTI, showing that UTI was more frequent in patients using indwelling catheterization and CIC as method of bladder drainage, consistent with findings of another study in which it was found that patients who use CIC as drainage method still had an increase chance to develop UTI as compared to normal voiding but less than indwelling catheter<sup>20</sup>. The method of bladder management should be based on urodynamic evaluation and diagnosis of the type of bladder dysfunction<sup>21</sup>. CIC is usually the primary recommendation for long-term bladder management<sup>22</sup>. For practical reasons, reflex voiding and Crede or Valsalva methods are still commonly in use, often combined with condom drainage in men. CIC and reflex voiding may be used simultaneously. In addition, indwelling catheter (urethral or suprapubic) remain in common use<sup>23</sup>. Although both are associated with very high incidence of UTI caused by resistant organisms. Lack of pyuria reasonably predicts the absence of UTI in SCI patients. Asymptomatic bacteriuria need not be treated with antibiotics. Symptomatic UTI warrants therapy in all patients<sup>24</sup>. Asymptomatic bacteriuria (ASB), incontinence, impaired bladder emptying, repeated instrumentation, vesiculoureteral reflux, indwelling urinary catheters, elevated intravesical pressure, stones, and neurological obstruction<sup>25</sup> are also prevalent in patients with SCI. Since chronic and recurrent infection is more prevalent in SCI patients we need to have knowledge of local bacterial spectrum and sensitivity to device empirical antibiotic therapy to start the treatment before the results of urine C/S is available to shorten treatment time and cost. There is no doubt that the greatest risk for complicated UTI in these individuals is the use of an indwelling catheter. Intermittent catheterization during the rehabilitation phase has been shown to lower the rate of UTI, and virtually eliminate many of the complications associated with indwelling catheters. If the patient has a reinfection or relapsing symptomatic UTI, it is important to

check for inadequately treated infection and complications, in particular residual urine and urinary stones. No reliable evidence exists of the effectiveness of cranberry juice, topical antiseptic agents and catheter flushing. Prophylactic antibacterial should only be used in patients with recurrent UTI where no underlying cause can be found and managed, and in particular if the upper urinary tract is dilated.

## CONCLUSION

Urinary tract infections were commonly observed among spinal cord injured patients in the presented institution. E-coli were the commonest isolated pathogen followed by Pseudomonas, Klebsiella pneumoniae, Proteus mirabilis, Citrobacter freundii, Candida and Morganella morganii. UTI was more frequent in SCI patients using catheterization as mode of voiding but more in indwelling catheterization as compared to IC, supporting use of IC in neurogenic bladder.

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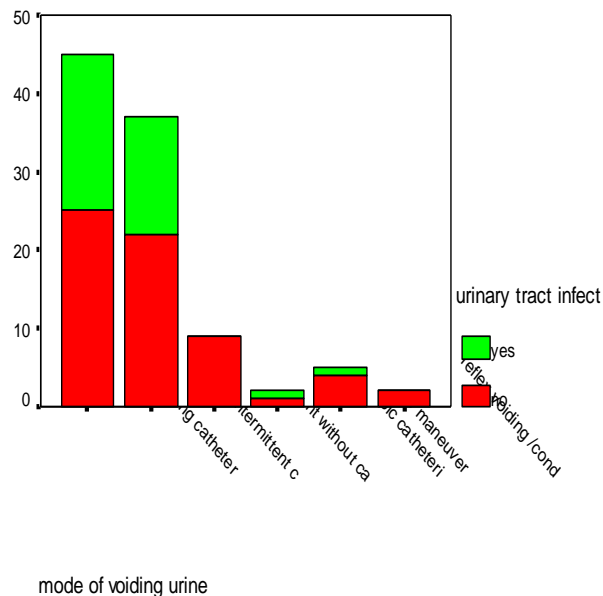


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**Table: Uropathogen obtained from urine culture**

Causative Organism	Frequency/ Percentage
E.Coli	20 (54.1%)
Pseudomonas	6 (16.2%)
K. Pneumonia	3(8.1%)
Proteus mirabilis	3 (8.1%)
Candida species	2 (5.4%)
Citrobacter freundi	2 (5.4%)
Margenella	1 (2.7%)



**Figure: Frequency of UTI in different modes of voiding**