

# Hospital Acquired Urinary Tract Infection: An Epidemiological Study Carried out in A Tertiary Care Hospital of North East India

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**ABSTRACT-** Urinary Tract Infections (UTI) is a major threat to human health. It is caused due to various physiological changes of the urinary tract by the activity of microorganisms. Urinary Tract infections have also been a major type of hospital acquired infection. Hospital acquired infections (HAI) are of various types: Respiratory Tract Infection (RTI), Urinary Tract Infection (UTI), Blood Stream Infection (BSI), and Surgical Site Infection (SSI) and the most common are Urinary Tract (39%) and Respiratory Tract (20-22%) infection. The main aim of this study was to assess various urine samples collected from patients of the ICU of a tertiary care hospital for microbial growth and create a statistical picture of the contribution of UTI to nosocomial infections. Certain governing factors for UTI like presence of pus cells, epithelial cells, and diabetes mellitus were also kept under consideration along with various patient details like age, sex, primary illness and prior antibiotic treatment. The key findings of the study were: the mean age of patients with symptomatic and asymptomatic UTI was 51 years and people from both genders within the age group of 41-60 were equally susceptible. *E. coli* was the most common causative organism (35.7%) followed by *Citrobacter* (21.42%) and *Klebsiella* (14.28%). Other organisms included *Pseudomonas*, *Enterococcus* and *Candida*. The rate of UTI was 56.22/1000 days of catheterization. Most of the organisms isolated were found to be multi drug resistant. UTI has been hence concluded to play a major contribution in nosocomial infections, which needs to be controlled by integrating proper monitoring of hospital data and surveillance of hospital acquired urinary tract infection.

**Key-words-** antibiotics, Center for Disease Control, ICU, Multi drug resistant Microorganism, Urinary Tract Infection

## INTRODUCTION

Urinary Tract Infection (UTI) is one of the most common bacterial infections noticed in primary health care second to respiratory illness. Women are particularly more vulnerable to develop UTI because of their short urethra and certain factors like delay in micturition, sexual activity and use of diaphragms and spermicides which promote colonization of coliform bacteria in the periurethral region. Infection in most women occurs when the bacteria present in the perineal or the periurethral region enter the urethra and ascend into the bladder (retrograde movement).

Among predisposing factors, it is seen that the rates of UTI are more in postmenopausal women because of the uterine prolapsed and incomplete bladder emptying; loss of estrogen due to changes in vaginal microflora (lactobacilli) which allows periurethral colonization with gram negative aerobes such as *E. coli* and *Klebsiella pneumoniae*; and concomitant illness like diabetes. It is generally defined as the condition of the presence of pathogens in the urinary tract with associated symptoms. There are two prevailing conditions of this disorder: when it affects the upper urinary tract it is called pyelonephritis and when it affects the lower urinary tract it is called the cystitis. The incidence rate of UTI is 1% of school-going girls and 4% in women who are in their child-bearing years <sup>[1]</sup>. In a study, conducted in the intensive care units of seven Indian cities shows that Central venous-Catheter related Bloodstream Infection (CVC-BSI) rate was 7.92 per 1000 catheter days; the Ventilator Associated Pneumonia (VAP) rate was 10.46 per 1000 ventilator-days and the Catheter Associated

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Urinary Tract Infection (CAUTI) rate was 1.41 per 1000 catheter days <sup>[2]</sup>.

In a review article by Nicolle *et al.*, it has been reported that in cases of Catheter Associated Urinary Tract Infection, 70–80% of the infections are attributed by the over use of an indwelling urethral catheter. Recent surveys also reported that 17.6% of patients are attached to catheter in 66 hospitals across Europe and 23.6% of patients across 183 hospitals in the USA. In another surveillance report in 2011 by National Health Service (NHS), it was reported that 45-79% patients were catheterized in the critical care unit <sup>[3]</sup>. This occurs mainly due to the development of biofilm in all the devices and is one of the major determinants of the development of bacteriuria with increased number of days of catheterization. Although the proportion of bacteriuric subjects is low, but the increasing use of instruments like catheters increase the percentage of attribution of occurrence of such infections <sup>[3]</sup>. It was also said that about 40% of the women have UTI once during their lifetime and a significant number of these women can develop recurrent UTI.

In the ICU generally a large number of antibiotics are administered to the patient, which as a consequence leads to the generation of more antibiotic resistant pathogens. This accounts for a major burden on patients and public health system of any country. Intensive care unit is one of the most potent sources of hospital acquired UTI infections even in hospitals of countries where extensive infection control measures are implemented on a regular basis. Antibiotic overuse and misuse partly due to wrong treatment, irrational and counterfeit market combinations and irregular consumption due to poor prescription and compliance are all factors for the widespread drug resistance among organisms which are hospital acquired. An international study of infections in ICU was carried out in 2007, which showed that patients who had longer ICU stays were more vulnerable and had a higher rate of nosocomial infection especially due to *Staphylococci*, *Acinetobacter*, *Pseudomonas* species and *Candida* species. Antibiotic resistance is a global concern which is particularly rising in developing countries such as India. Although, the pattern of organisms causing the infections vary widely from one hospital to another and also from one country to another. Presently, India lacks a national or local surveillance program which would guide the hospital administration on the actual prevalence of resistance and thus hospital-acquired UTI <sup>[4]</sup>.

## MATERIALS AND METHODS

The study was carried out in the Department of Pathology, GNRC Hospitals, Assam, India from 22<sup>nd</sup> May–22<sup>nd</sup> June, 2015.

A midstream urine (MSU) sample was generally considered appropriate for bacterial culture. The patient was provided with a sterile container generally wide-mouthed and leak-proof. The patient was usually advised to clean the area and empty the first part of the urine and then collect

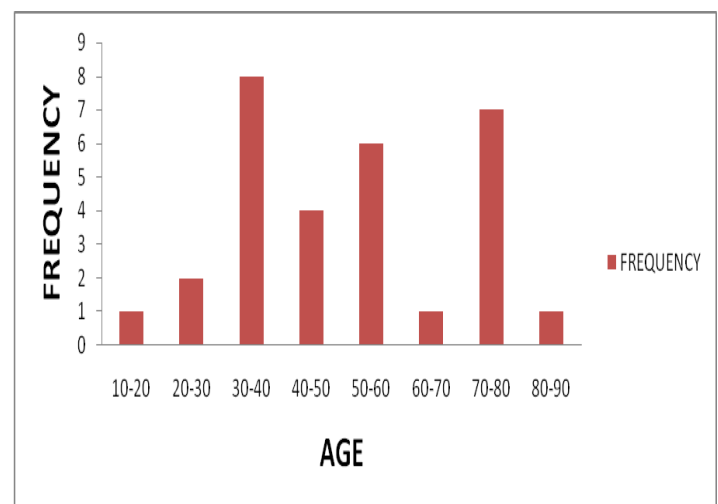
the ‘midstream’ urine into the container. The sample collected was transported within half an hour or was refrigerated at 4°C for up to 4 hours. The sample should not be kept outside for too long since urine is a very good medium for multiplication of contaminating bacteria which might show false positive results <sup>[5]</sup>.

The samples were collected from ICU patients in sterile containers. A total of 30 patients were selected for the study. The inclusion criteria of the patients selected in the study were that the patient had spent over two weeks in the ICU. Other essential information about the patients like the primary illness, the medical procedure availed, secondary illness and the medication was made a note. All statistical calculations were made using Minitab version 17 statistical software. The method of sampling was indigenous to the study.

On the basis of lactose and non-lactose fermentor, bacterial colonies were isolated various biochemical tests like IMViC, Catalase, Coagulase and Oxidase were done to identify isolated colonies up to species level. For antibiotic susceptibility test, the inoculum was prepared following the MacFarland standard protocols. Amoxicillin/Clavulanic (50/10 mcg) acid, Ampicillin (10 mcg), Cefopime (30 mcg), Cefoxitin and Co-Trimoxazole (25 mcg), Piperacillin Tazobactam (100/10mcg), Meropenem (10 mcg/100), Colistin and Norfloxacin (10mcg) were used <sup>[6]</sup>.

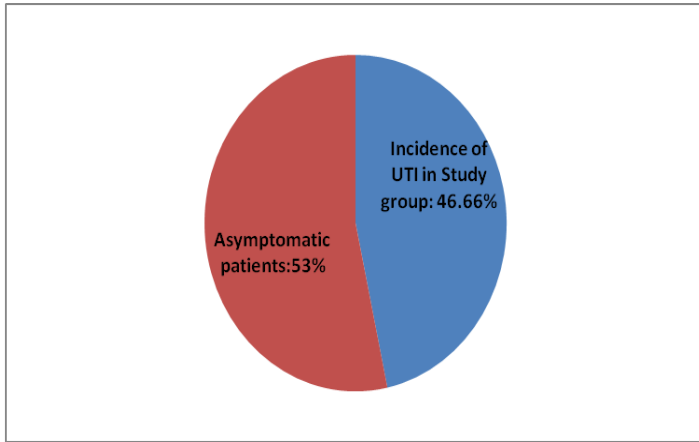
## RESULTS

A total of 30 urine samples were collected from indoor patients of the ICU and semi- ICU, who were catheterized. The total number of patients present in ICU and Semi- ICU during the months of May- June, 2015 was 191 and the number of catheterized patients was 80 (41.88%).



**Fig. 1:** Age wise frequency of UTI patients

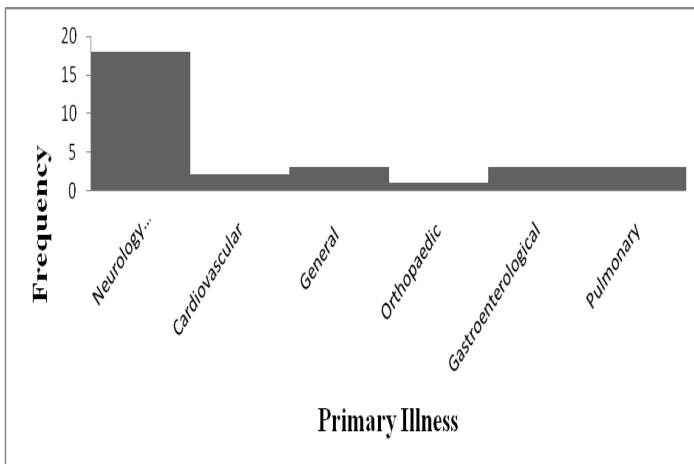
The mean age of patients were found to be 51 and the age group between 41-60 shown significant symptoms of UTI. The mean age of UTI positive patients were absolute values. Of the 30 patients in the study, 14 were found to be positive with symptomatic UTI, hence the occurrence of infection was 46.66 %.



**Fig. 2:** Percentage of Infection in the study

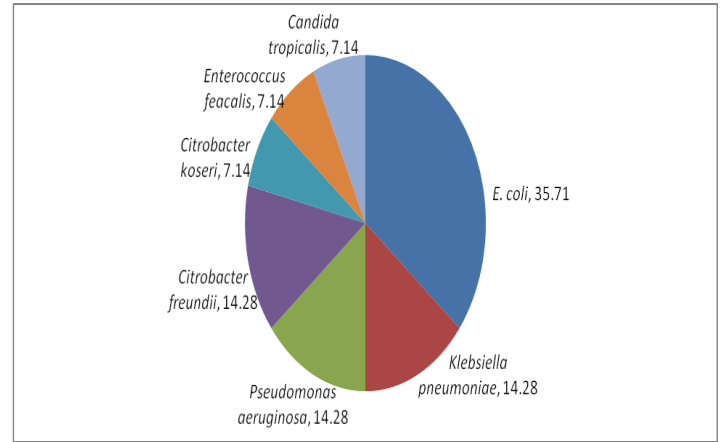
In the gender wise comparison of the occurrence of infection, males were more prone to UTI. The prevalence of UTI in males was 52.30% and females 33.30%.

The next aspect taken into consideration was the primary illness of the patients. Since the research centre is basically a neurology research centre, it was seen that most of the patients were suffering from neurological problems, although there were sparse distribution of Cardio-thoracic Vascular Symptom (CTVS), orthopaedics, pulmonary and other general diseases like fever evaluation, cough and cold.



**Fig. 3:** Frequency of primary illness of patients

After the preliminary microscopic examination of the primary culture by gram staining, the causative organism was determined by various biochemical tests followed by an antibiotic sensitivity test. The various causative organisms were:



**Fig. 4:** Distribution (5) of various causative organisms

All the bacterial isolates were found to be Gram negative. This included *E. coli* as the major contributor (35.71%), followed by *Citrobacter* spp (21.42%). Other minor organisms included *K. pneumoniae*, *P. aeruginosa* (14.28%) and *C. tropicalis* (7.14%).

The average days of catheterization of all the patients under this study were found to be 249 days and hence the rate of catheter-associated UTI (CAUTI) was found to be 56.22/1000 days of catheterization.

In the antimicrobial susceptibility test, most of the Gram-negative isolates were sensitive to antibiotics like Cefopime, Meropenem, and Piperacillin, Tazobactam and Colistin whereas most of them were showed resistant to Amoxicilin/Clavulanic acid, Ampicillin Cefoxitin and occasional resistance to Co-Trimoxazole, & Norfloxacin. *Candida tropicalis* showed sensitivity to Flucocytosine and resistance to Fluconazole, Itraconazole, Voracinazole and Amphotericin.

**DISCUSSION**

The general results of this study were compared to other researches around the globe. It was concluded that *E. coli* is the most frequent causative organism of UTI as reported (Pattanayak and Patanaik [4]. *Candida* sp. has been reported as a less common pathogen by Mohammed *et al.* which supports our study [7]. The major predisposing factors found medically occurring in case of UTI are mainly presence of pus cells in urine sample (64.28%), patient has underlined history of diabetes mellitus (35.71%), and patient has fever due to sudden occurrence of urine infection (35.71%) as reported by [8]. The results of our study was shown 46.66% of occurrence among all patients, which was in agreement with the study of Boye and Siakwa [9]. Although Nicolle [3] reported a much lower incidence among USA and European countries had 17.6% and 23.6%, respectively. He further reported that among all hospitals, 45-79% of the patients in critical care unit are catheterized, which is also in agreement with our studies [3]. Our conclusion that the men have greater percentage of UTI is in agreement with Koshariya *et al.* [10] he age group of 41-60 have higher rate of UTI, which is in agreement with Boye

[8]. The majority of the studies report women have high susceptibility to UTI, which is contradicted by the present study of Patel *et al.* [11].

## CONCLUSIONS

As a preventive measure of all the nosocomial infections, it is said that all healthcare associated centers will have a infection control society whose main functions will be: review and approve a yearly program for surveillance and prevention, to review epidemiological data and identify areas for intervention, to assess and promote improved practice at all levels of health facility and to ensure appropriate staff training in infection control and safety. After this study was conducted for the time span as mentioned and preventive measures were taken by proper replacement of Foley's catheter and also a change in the pattern of the antibiotic treatment in ICU, there was a significant decrease in the occurrence of UTI among ICU patients. The UTI rate of occurrence in the month of July to August was less than 20%.

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