Original article:

Evaluation of nosocomial urinary tract infections in a tertiary care setting

Swapna Mahapatra[1], Y.Roja Ramani[2], SarojShekhar Rath[3], Benu Panigrahy[4], C S Maharana[5]

[1]Senior Resident, Department of Pharmacology, M.K.C.G Medical College, Berhampur, Odisha.

[2]Assistant Professor, Department of Pharmacology, M.K.C.G Medical College, Berhampur, Odisha.

[3]Pediatric Specialist, DHH Boudh, Odisha.

[4]Assistant Professor, Department of Urology, M.K.C.G Medical College, Berhampur, Odisha.

[5]Professor, Department of Pharmacology, M.K.C.G Medical College, Berhampur, Odisha.

Corresponding author: Y Roja Ramani Assistant Professor, Department of Pharmacology, MKCG Medical College, Berhampur, Odisha

Abstract:

Introduction: Nosocomial infections or hospital-associated infections are estimated to occur among 7-12% of the hospitalized patients throughout the world, with more than 1.4 million people suffering from its associated complications at any time. More than 30% of nosocomial infections are urinary tract infections (NUTIs). The present study aimed to find out different etiological agents and risk factors associated with NUTI, drug use pattern to treat NUTI in a tertiary care setting.

Materials and Methods: It was a cross-sectional prospective study of 8 weeks duration from different clinical departments of a tertiary care hospital. We included patients who developed UTI following 48-72 hours of admission to hospital. Culture sensitivity of urine samples was done along with other routine investigations.

Results: Majority of patients obtained were from Obstetrics & Gynecology Department followed by Orthopedics. There were no associated risk factors in majority of cases and in those who had risk factors, diabetes was most common. Most common etiological agent was E. coli followed by Staphylococcus aureus. E. coli was most sensitive to Nitrofurantoin, while Staphylococcus was sensitive to Amikacin. In non-catheterized patients, Piperacillin-tazobactam was commonly prescribed while Nitrofurantoin was prescribed in catheterized nosocomial UTI patients.

Discussion: E.Coli being an Enterobacteriacae colonizes the urogenital mucosa with adhesion, pili, fimbriae and P1-blood group phenotype receptor. Nosocomial UTI is common in catheterized patients as catheters inoculate micro-organisms and colonise them.

Conclusion: Nitrofurantoin has maintained its effectiveness over time and therefore it seems to be a good choice for the empirical management of NUTIs.

Keywords: nosocomial urinary tract infections, isolates, prescribing pattern

Introduction:

Hospitalization for an acute illness, trauma, chronic care or other health care conditions is a common occurrence which has got its associated risks, including risk of infection. According to World Health Organization (WHO) these infections occur among 7-12% of the hospitalized patients throughout the world, with more than 1.4 million people

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suffering from its associated complications at any time[1, 2]. A nosocomial infection is usually defined as a new infection that is identified at least 48 -72 hours following admission or within 48 hours after being discharged[3]. With the increased use of invasive procedures at least 8% of patients acquire nosocomial infections. This places a substantial burden on individual patient as well as on the economy of health care system. A MEDLINE database search in 2014 revealed that, more than 30% of nosocomial infections are urinary tract infections (UTIs). A UTI is defined 'nosocomial' (NUTI) when it is acquired in any healthcare institution or, more generally, when it is related to patient management[4].

Apart from UTI, other nosocomial infections are surgical-wound infection, pneumonia, and bloodstream infection. At least 80 percent of nosocomial urinary infections (NUTI) are attributable to the use of an indwelling urethral catheter[4, 5]. Also patients on urological disorders, chronically ill elderly male patients and those with debilitating diseases suffer from UTI's. The causative organisms may originate from the patient himself or from the hospital environment. According to the Centers for Disease Control and Prevention (CDC), more than 70% of the bacteria that cause such infections are resistant to at least one of the drugs most commonly used to treat them[6]. Hospitalized patients who contract an infection with an antibiotic-resistant organism face more medical complications than patients who do not acquire an infection (Neiderman MS, 2001).

Adverse consequences of NUTI include increased exposure to antimicrobial therapy and its potential adverse effects, local and systemic morbidity, secondary bloodstream infection, increased laboratory and imaging investigation costs and prolonged hospitalization[7]. The average prolongation of hospital stay has been found to be 3.8 days for urinary infection. Therefore targeting NUTI and its periodic surveillance is necessary to decrease their incidence as well as for providing quality health care.

Objectives- The present study aims to,

1. Investigate the etiologic agents and risk factors for NUTI
2. Delineate the prevailing drug therapy & susceptibility pattern of the isolates to different antimicrobial agents
3. Evaluate their effectiveness in terms of treatment outcomes

Methodology-

This was a cross sectional prospective study of 8 week duration among the inpatients of ICU, Internal medicine, General surgery, urology, orthopedics, Obstetrics & Gynecology departments of the this tertiary care setting. Approval of Institutional Ethics Committee & the respective department heads was obtained before starting the study. Around 60 adult patients of either sex suffering from nosocomial urinary tract infection were enrolled. The written informed consent was obtained from the patient before enrolling them in the study.

Sources of data-

-   Patient interview
-   Patient case sheet, medication chart and laboratory reports

Inclusion and exclusion criteria for patient selection were as follows:

Inclusion criteria:

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1. Patients developing UTI following 48-72hrs of admission to the hospital for any disease condition other than UTI
2. 15-80 yrs age group
3. Both male and female patients
4. Both catheterized as well as non-catheterized patients

Exclusion criteria:

1. Patients admitted to hospital with UTI
2. Pediatric age group

A predesigned validated case record form was used for data collection. Bedside history (clinical / drug) & examination of patients was done on daily basis. NUTI was diagnosed as per the CDC definition[5] as follows:-

- Any episode of UTI that was not present in first 48 hr of admission, and became apparent after 48hr of admission was diagnosed as NUTI.

- Presence of at least two of the following with no other recognized cause : fever, urgency of urination, dysuria or supra-pubic tenderness;

- With at least one of the following: pyuria or positive urine culture.

All the routine investigations such as complete blood picture, blood sugar level, urine analysis and chest radiograph was done at day 1(diagnosis of NUTI), day 7 and day 14. Similarly on the same days Culture and Sensitivity(C/S) of mid stream "clean catch" urine specimen in non catheterized patients and Catheter samples of urine (CSUs) in catheterized patients was done for diagnosis, assessment of the treatment response to urinary tract infection and to detect the evidence of development of any new infection. Data of other relevant investigations were collected after taking opinion from consultants of relevant departments. Outcome measures such as cure rate, mortality, readmission within 30 days, and ICU admission was also recorded.

Data Analysis

Analysis of all clinical and laboratory data was carried out using the Graph Pad Prism 5.0 software. Statistical significance of association was tested using the chi-square test or fisher exact test to compare proportions and the unpaired t-test for continuous variables at 5% level of significance.

Results:

Fig-1:

Age vs gender among NUTI patients
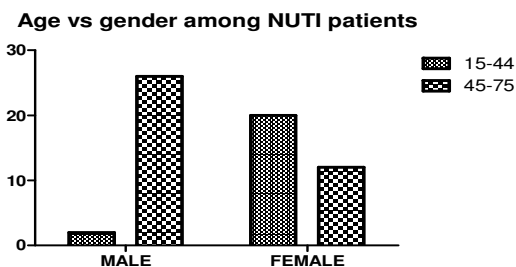
Data analysed by chi-square test with p<0.0001

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Table-1: RISK FACTORS ASSOCIATED WITH NUTI

RISK FACTOR	CATHETERISED (%)	NON- CATHETERISED (%)
NO RISK FACTOR	43.48	42.86
DIABETES	0.00	28.57
BHP	0.00	14.29
URINARY STONES	4.35	0.00
PREGNANCY	21.74	0.00
STROKE	4.35	0.00
UTERINE PROLAPSE	4.35	0.00
OBTRUCTIVE UROPATHY	4.35	0.00
OTHERS	17.39	14.29

r =0.561, p=0.116

Table-2: Frequency of isolates and their sensitivity pattern in NUTI

Sl. no	Frequency of isolated organisms	Sensitivity pattern	Percentage of sensitivity (%)
1	E.coli (41%)	Nitrofurantoin	41.67
		Linezolid	25
		Ampicillin+Sulbactam	20.83
		Gentamycin	12.50
2	Staph. Aureus (33%)	Amikacin	50
		Co-amoxyclav	25
		Linezolid	12.5
		Vancomycin	12.5
3	Pseudomonas (13%)	Piperacillin+Tazobactam	50
		Ceftazidime	25
		Imipenam	25
4	Proteus (13%)	Nitrofurantoin	37
		Linezolid	25
		Gentamycin	25
		Ampicillin+Sulbactam	13

Fig-2: Prescribing pattern of antibiotics in non-catheterized patients
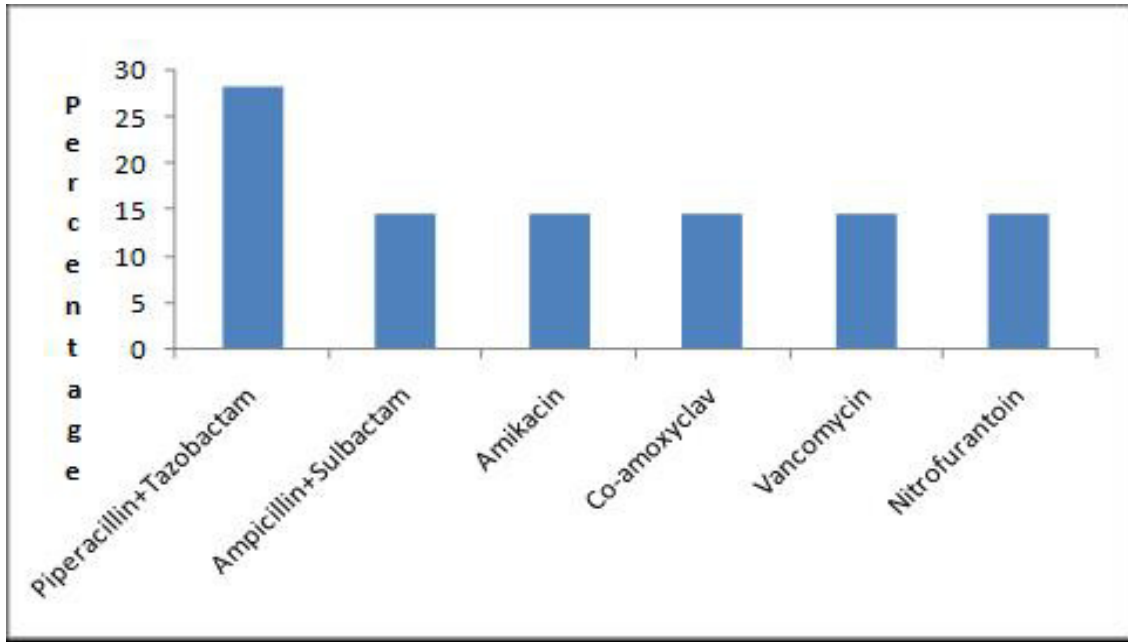
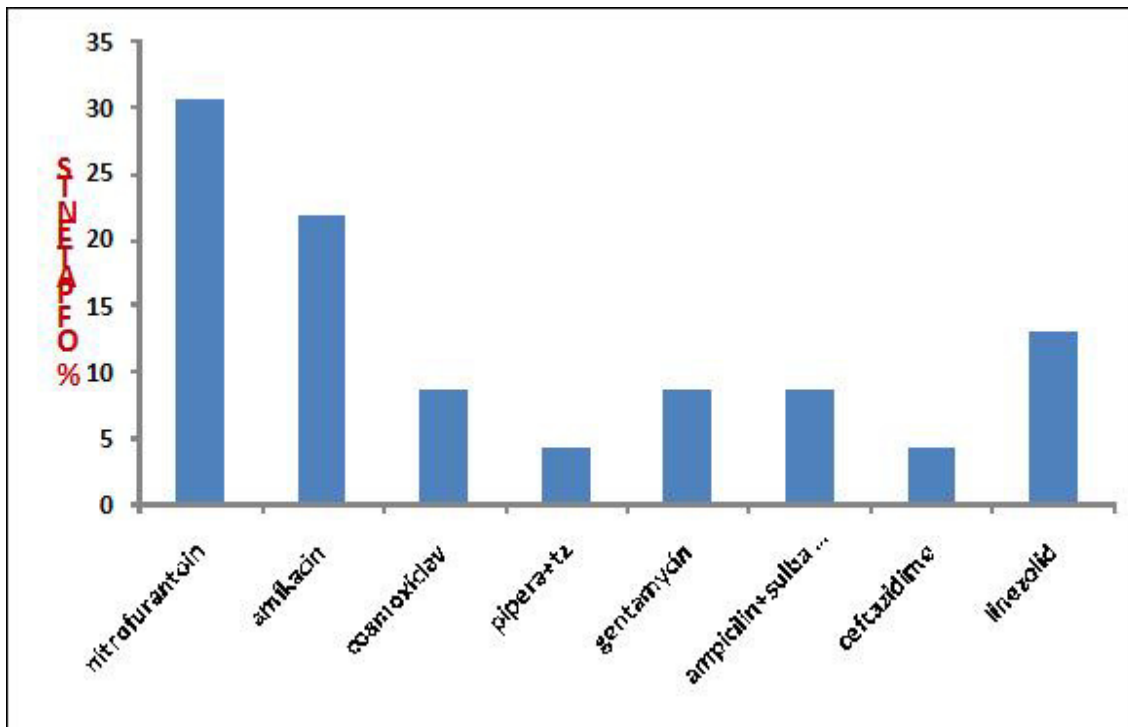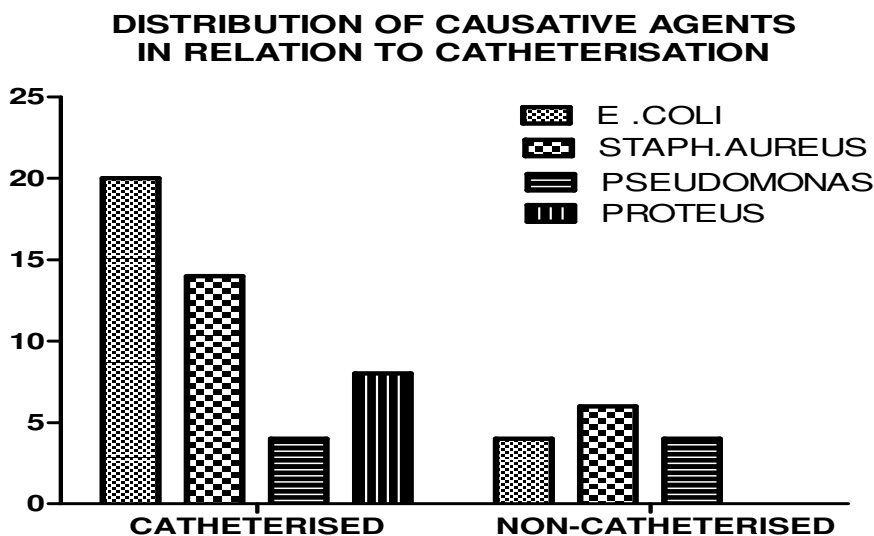**Fig-3: Prescribing pattern of antibiotics in catheterized patients**

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Fig-4:

DISTRIBUTION OF CAUSATIVE AGENTS
IN RELATION TO CATHETERISATION

Table-3: **Outcome measures of NUTI**

Duration of NUTI (% of patients)			Cured (%)	Readmission (%)	ICU (%)	Mortality (%)
<5 days	5-10days	10-15days				
13.33	70.00	16.67	93.33	6.67	0.00	0.00

Discussion

In the present study, majority of NUTI patients in age group of 15-44yrs were females and 45-75 yrs were male. E coli was the isolate in 37.5 % of female and 42.86 % of male. [Fig.1] Seventy six % (76%) of NUTI patients were catheterized (duration 3-5days). Nosocomial infections increase with the use of invasive devices like urethral catheters (80% increased risk) and with increased duration of hospitalization[5]. Catheter-related urinary tract infection (UTI) occurs because urethral catheters inoculate organisms into the bladder and promote colonization by providing a surface for bacterial adhesion and causing mucosal irritation.[8] Women, elderly persons, and patients with impaired immunity are at a higher risk to develop catheter associated UTI's [9]. In the present study majority of patients also belonged to Obstetrics and Gynaecology department amongst whom 21.74% of the NUTI cases were pregnant & catheterized. Among the total patients enrolled in the study, 63% were operated cases. Highest incidence of microorganism was E.Coli followed by Staph. Aureus, Pseudomonas and Proteus respectively. [Table -2] Studies report that the frequency of *E. coli* is high in short-term catheterization[10]. It was the commonest organism isolated among catheterized patients in this hospital and was sensitive to Nitrofurantoin, but in non-catheterized patients Staphylococcus aureus was most common isolate being sensitive to amikacin, co-

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amoxiclav and vancomycin equally. [Table -2, Fig 4] The above findings corroborate with that of the study by Kothari A et al.[11-13] The E.Coli bacteria belongs to Enterobacteriacae group. Enterobacteriacae have several factors responsible for their attachment to urothelium. These gram negative aerobic bacteria colonize the urogenital mucosa with adhesion, pili, fimbriae and P1-blood group phenotype receptor[14]. Also the prescribing pattern of antibiotics usage study in NUTI patients showed 10 different types of antibiotics prescribed and 90% patients were on combination antibiotics. Nitrofurantoin was the most frequently prescribed antibiotic among catheterized and Piperacillin with tazobactum was the commonly prescribed combination among non-catheterized patients. [Fig. 3 & 4] In our study 70% were hospitalized for 5-10 days. Among all NUTI patients, 93.33% were cured by antibiotic therapy, only 6.67% were re-admitted to hospital for other complications and there was no ICU admission or mortality rate.[Table -3]

Conclusion:

Complication from inadequately treated UTIs contributes to increased patient morbidity, increased healthcare costs and increased drug resistance. Nosocomial infections are an important preventable cause of increased morbidity and mortality in hospitalized patients. Nitrofurantoin has maintained its effectiveness over time and therefore it seems to be a good choice for the empirical management of NUTIs. Minimisation of catheter use as well as its duration of use should be kept in mind while managing patients in high risk group like women, elderly and immunocompromised. Further such antibiotic usage studies in NUTI, for long term and in a larger population will help in updating the existing antibiotic utilization guidelines and will also promote the rational prescribing practices.

Acknowledgements:

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