# Bacterial Types and Resistant Pattern of Secondary Bloodstream Infections Patients with UTI in Several Hospitals in Northern Part of Bangladesh

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## Abstract

Secondary bloodstream infection (BSI) is common health care–associated urinary tract infection (UTI) and widely found in hospitals and long-term care facilities. Recent studies reported blood stream infection pathogens showing resistance to most commonly prescribed antimicrobial drugs. Area and primary disease specific study to find out the microorganisms responsible for BSI and their resistant pattern to antibiotics which will help clinician to choose proper therapies and treatment strategies in future. The bloodstream infection rate was observed 27% among 200 patients who were already in UTI. *E.coli* was most frequent indentified bacteria and amikacin found most effective among the antibiotic for bacteria we found in blood samples of BSI patients.

## Keywords: BSI, pathogens, antimicrobial, resistant.

## Introduction

Nosocomial urinary tract infections (UTIs) as health care associate infection is more common and severe for patient with health care risk factors like weak immune system due to other disease, dialysis or staying in hospital with catheter [1-3]. Bloodstream infection (BSI) is also global concern for patient with healthcare-associated infections (HAIs) such as urinary tract infections, patients in a hospital, GP clinic, nursing home, patient's in home after discharge or any other healthcare facility [3-7]. These infection are not usually present at the time of hospital admission [8]. The impact of bloodstream infection includes increased risks of patient morbidity and mortality, extended hospital stay, additional suffering, decrease quality of life and also extra cost to treat the infection which burden both for patient and health care system [9]. Depending on the patient's age, severity of UT infection and other risk factors and hospital prevention planning and facilitates the mortality rate for BSI varies between 5 and close to 50% [10-14].The bacterial etiology of BSI varies according to the geographic location, seasons, age and immune state of patients[15-18].

The aim of the current study is to identify cases of secondary bloodstream infection of patients with primary UTI and most prevalent bacteria involved in secondary BSI in few hospital and private clinics which

assist early diagnosis of pathogens and treatment final outcome might be much better. Such information provide a powerful way to develop prevention and therapeutic strategies and also will reduce morbidity, mortality, improve quality of life and cost associated with treatment.

## Materials and Methods

### Patients and period of Study:

We collected blood samples from in patients from two different private clinics and a tertiary government hospital in north region of Bangladesh. The govt hospital has 200 seats with average daily patients around 500 and clinics have 50 seats with patients usually 50 daily in average. We choose 200 patients both male and female including short and long term patients with catheter from a period 1st September 2015 to 31st August 2016 (Table 1). The blood samples were collected and processed in laboratory to detect causative bacteria by BACTEC Myco/F lytic blood culturing vials [15, 19, 20]. The BSI is considered as secondary when all the patients have already UTI, both UTI and BSI caused by same pathogen and also BSI developed same day or subsequent day of UTI [2]. Kirbybauer technique was applied for bacterial isolation and standard disc diffusion method for testing antibiotic susceptibility using a range of antibiotics like ampicillin, gentamicin, amikacin, cephalexin, ciprofloxacin, quinolones and ceftazidime [21-23].

**Table 1: Patients characteristics (n=200) and total bloodstream infected 54**

| Category of patients of UTI | Age (Mean ± SD) years | BSI |
| --- | --- | --- |
| **Male (100)** | **40 ± 20** | **15** |
| Female (35) | 40 ± 20 | 5 |
| Diabetic (30) | 60 ± 15 | 12 |
| Caesarean patients (35) | 25 ± 8 | 5 |
| Short and medium term catheter (30) | 60 ± 10 | 7 |
| Long term catheter (25) | 65 ± 8 | 10 |

# Results and Discussion

The blood samples collected from patients with UTI according to table 1. Out of 200 catheterised patients, 54 were suspected to BSI (Figure 1). Among 100 male patients with UTI we identified 15 patients BS infected whereas for 5 females suffered by BSI. The Blood samples 12 diabetic patient out of 30 and 5 caesarean patients out of 35 were detected to BSI. Among those patients who were used catheter for long time detected BSI up to 40%. The blood sample detected pathogen 27% (Total 200 UTI patients). The most common bacteria grown on the culture media, detected gram negative bacteria upto 70%. Among gram negative bacteria E. coli almost 45% in all cases, were Klebsiella spp range (15%) and Enterococcus spp (17% to 23%) (Table 2). Whereas we found gram positive bacteria and fungus 25% and 5% respectively. The most common gram positive species Staphylococcus aureus (50%), Enterococcus faecalis (20%), Enterococcus faecium (~10%) (Table 2). On the other hand, candida species are most common in case of fungal BSI up to 90%.

Then we moved and dicided to check antibiotic susceptibility testing of bacteria found in blood samples using antibiotic like ampicillin, cephalexin, gentamicin, amikacin, cotrimoxazole, ciprofloxacin and ceftazidime (Table 3).The highest sensitivity was for amikacin (~72%), ceftazidime (65%), ciprofloxacin (~63%) and all other tested antibiotic susceptibility (34% to 60%) (Table 3).We also reported resistant to all tested antibiotics and were found in case of E.coli (8%), klebsiella (3%) as well as Staphylococcus spp (1%).

**Table 2: Bacteria isolated and identified from blood samples of patients (n=54).**

| Microorganism | Total (%) |
|---|---|
| **Total Gram-negative bacteria** | **70 ± 8** |
| *E. coli* | **45 ± 5** |
| *Enterobacter aerogenes* | **10 ± 7** |
| *Klebsiella spp* | **15 ± 1** |
| *Enterobacter species* | **20 ± 3** |
| *Other organisms (Citrobacter, Proteus etc)* | **10 ± 5** |
| **Total Gram-positive bacteria** | **25 ± 10** |
| *Staphylococcus aureus* | **50 ± 4** |
| *Enterococcus faecium* | **10 ± 4** |
| *Enterococcus faecalis* | **20 ± 1** |
| *Rhodococcus* species | **10 ± 5** |
| *Streptococcus species* | **10 ± 1** |
| **Yeast** | **5 ± 2** |
| *Candida* species | **90 ± 15** |
| other | **10 ± 3** |

## Conclusion

Among different category of patients, we observed, UTI patients with diabetic found highest rate BSI and more patient who had indwelling catheter for longer period of time more susceptible to blood stream infection. *E.coli* was the most common bacteria detected in all collected blood samples which showed higher sensitivity to amikacin and lowest to cotrimoxazole. Amikacin, ceftazidime, and ciprofloxacin showed best activity among the drugs we tested if we consider the mean value. As current study was only performed in one public hospital and two clinics in located in northern part of Bangladesh further regular monitoring all other hospitals and large number of patients thorough out the year on that region to identify exact epidemiologic information about secondary blood stream infection and resistance pattern of different microorganism patients with UTI.

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**Table 3: Antibiotic susceptibility testin**

| Microorganisms | Sensitivity (%) | | | | | | | Resistance to all (%) |
|---|---|---|---|---|---|---|---|---|
| | Ampicillin | Cephalexin | gentamicin | amikacin | Cotrimoxazole | Ciprofloxacin | ceftazidime | |
| *E. coli* | 60 | 56 | 72 | 83 | 46 | 70 | 68 | 8 |
| *Pseudomonas aeruginosa* | 48 | 40 | 70 | 50 | 38 | 56 | 38 | - |
| *Staphylococcus saprophyticus* | 22 | 58 | 58 | 80 | 50 | 55 | 63 | 1 |
| *Klebsiella spp* | 30 | 18 | 60 | 65 | 28 | 71 | 78 | 3 |
| *Enterococcus spp* | 20 | 26 | 48 | 86 | 40 | 60 | 75 | - |
| *Rhodococcus* species | 25 | 20 | 30 | 65 | 30 | 65 | 68 | - |
| *Candida sp.* | ND | ND | ND | ND | ND | ND | ND | ND |
| *Other organisms* | ND | ND | ND | ND | ND | ND | ND | ND |
| Mean | 34.1 | 36.3 | 56.3 | 71.5 | 38.6 | 62.8 | 65 | ND |
| ND: Not determined | | | | | | | | |