



EXTENDED SPECTRUM B- LACTAMASES (ESBL) PRODUCER E.COLI IN CAUTI IN ICU PATIENTS IN NORTH BIHAR.

Microbiology

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ABSTRACT

Extended-spectrum β -lactamases (ESBL) producing micro-organism increases infection in catheter associated (CAUTI) urinary tract infection and led to limitations of treatment options. The aim of our study is to know the prevalence of ESBL producing E. coli spp. at a tertiary hospital in north bihar.

Methods: A total of 250 mid-stream urine (MSU) samples were collected during the study period from October 2017 to September 2019. Identification of the isolates was done by Gram's staining followed by biochemical tests. ESBL screening among E. coli spp. isolates were done by phenotypic disc diffusion test method (combined disc method) using ceftazidime (30 μ g) and ceftazidime plus clavulanic acid (30/10 μ g).

Results: A total of 150 samples showed significant bacteriuria with 30 (20 %) E. coli. By combined disk test, 20 (66.6%) E. coli spp. were found ESBL producers.

Conclusion: Prevalence of ESBL producing E. coli spp. is high among catheter associated urinary tract infection. Prompt effective diagnosis and management of MDR strains is necessary in clinical setting to decrease morbidity among admitted patients.

KEYWORDS

INTRODUCTION

The incidence of nosocomial infections in intensive care units (ICU) is showing a rising trend mainly because of increasing invasive procedures performed in the ICU. Modern medical care is heavily dependent on a reliable and safe vascular access. However these intravascular devices, which provide a stable access on one hand, are also associated with significant potential for producing iatrogenic disease on the other, resulting in catheter-related bacteremia^[1].

Infection frequently occurs after the placement of urinary catheters^[2,3]. Each day of urethral catheterization carries a risk of significant bacteriuria, which has been estimated to be 5 to 10% per day^[3]. Urinary catheterization for more than 2 days is by far the most important risk factor for acquisition of a urinary tract infection (UTI)^[4]. The incidence of urosepsis, which is defined as an inflammation of the upper urinary tract resulting in sepsis and bacteremia, occurs in approximately 16% of an Intensive Care Unit population^[5]. Funguria, mostly candiduria, is the other concern, which is reported in 3%–32% of patients catheterized for short periods of time^[6,7]. Management of all these complications, causes increased treatment costs, besides contributing to prolonged use of antimicrobial therapy, increased length of hospital stay, physician visits, and morbidity^[8].

A range of gram-negative and gram-positive organisms, can cause nosocomial CAUTI including *Escherichia coli*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Enterococcus faecalis*. These infections are often polymicrobial and can last from several days to months^[5]. Multiple drug resistance has significantly increased in recent years. There is a growing concern for multidrug-resistant Gram-negative bacteria which produce extended-spectrum β -lactamases (ESBLs) [9]. ESBLs are Class A β -lactamases that hydrolyse penicillin, oxyimino-cephalosporins, and monobactams but not cephamycins or carbapenems [9]. They are inhibited in vitro by clavulanate. ESBLs are often plasmid-mediated enzymes and have various genotypes. The most common are the SHV, TEM, and CTX-M types. Other clinically important types include VEB, PER, BEL-1, BES-1, SFO-1, TLA, and IBC [9]. ESBLs are primarily produced by the Enterobacteriaceae family of Gram-negative organisms, in particular *Klebsiella pneumoniae*, *K. oxytoca* and *E. coli*^[7-9]. They are also produced by other Gram-negative organisms, such as *Acinetobacter baumannii*, *Proteus* spp, *Pseudomonas aeruginosa* and *Salmonella* spp.^[10].

These large reservoir of antimicrobial-resistant organisms, arising from the catheter and can be the source of cross-infection. It is reported that 15% of episodes of hospital-acquired bacteriuria occur in clusters, and these often involve highly resistant organisms^[11].

Aim & Objectives:

The aim of our study is to know the prevalence of ESBL producing E.

coli spp. at a tertiary hospital in north bihar.

Material And Methods:

An observational study was carried out at Sri Krishna Medical College & Hospital during October 2017 to September 2019

All consecutive sample of catheterised patient, who were catheterized in ICU for more than two days have been collected for bacterial culture & antibiotic sensitivity.

Urine was collected by standard aseptic procedure. The sampling port of the catheter was disinfected with 10% povidine-Iodine and 3ml of urine was aspirated with a sterile syringe^[11].

Urine samples were transferred to the laboratory within 1hr of collection. Samples were processed as per standard microbiological techniques by Gram's staining followed by biochemical tests^[12]. ESBL screening among E. coli spp. isolates were done by phenotypic disc diffusion test method (combined disc method) using ceftazidime (30 μ g) and ceftazidime plus clavulanic acid (30/10 μ g)^[6,7,13].

RESULT:

A total of 150 samples showed significant bacteriuria with 30 (20 %) E. coli. By combined disk test, 20 (66.6%) E. coli spp. were found ESBL producers.

Table 1: Extended spectrum β -lactamases (ESBL) producer E. coli in CAUTI in ICU patients

Gender of the patient	ESBL Producer		Total	P value
	Yes	No		
E.COLI	20	10	30	P=0.8821
OTHER ISOLATES	18	102	120	
Total	38	112	150	

• Chi square value = 0.0001, degree of freedom = 1

DISCUSSION:

Up to 25% of hospitalized patients have a urinary catheter placed during their stay in hospital with 1 in 5 patients admitted in ICU receiving an indwelling catheter^[1-4]. CA-UTIs constitute over 1 million cases annually and over 25- 40% of all nosocomial infections^[2,9]. They comprise 80% of all nosocomial UTIs [9]. The risk of bacteriuria following urethral catheterization is approximately between 5 to 10% per day^[8].

CAUTI affects 10.6% to 12.6% of catheterized patients^[10]. According to a study by Saint *et al*, 26% of patients who have an indwelling catheters for 2 to 10 days will develop CAUTI^[10]. In an Indian study carried by Jaggi *et al*^[18], incidence of CAUTI was 2.3-25.3/1000 catheter days, average CAUTI rate was 7.93 which varied between

10.6-5.6. In a study by **Datta *et al***^[16], the rate of CA-UTI was 10.75%. In the present study, we found the prevalence of CAUTI to be 21.33%, this is comparable to an earlier study published on nosocomial infection by **Singh *et al***, where the urinary tract infections developed in 8 out of 36 catheterized patients with a rate of 22.22%^[17]. Our rates is higher than the other studies and this could be attributed to the fact that this study concentrated in the intensive care unit.

CONCLUSION

Health care associated infections affect a vast majority of patients, especially those admitted in the ICU. Majority of these infections are related to the use of devices which have become indispensable in modern care. One of the most commonly used such devices, urine catheters can lead to catheter associated urinary tract infection, which may further complicate patient's illness and contribute to patient morbidity and mortality. In this study, *E. coli* was found to be the most predominant MDR isolate. The prevalence of ESBL producing *E. coli* was higher. The majority of ESBL producing *E. coli* were resistant to antibiotics used for treatment of UTI^[14]. Imipenem was the most effective antibiotic and could be the drug of choice for treatment of infections caused by ESBL strains^[7,15].

Regular surveillance of these infections especially in the ICU settings to estimate the burden of infection is an essential step in the infection control and quality care assurance to patients. Prevalence of these infections is increasing especially in the developing countries and more studies are required on this subject.

The most important strategy in the prevention of infection is avoiding unnecessary placement of indwelling catheter, ensuring staff hygiene, avoiding repeat catheterizations and using alternates to indwelling urine catheterizations. CAUTI are associated with isolation of microorganisms with increased antimicrobial resistance leading to complications in patient management and prolonged hospital stay of patients. Early detection of these infections therefore and a hospital policy on prevention and management of device related infections may help in the control of these infections.

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