ORIGINAL RESEARCH PAPER

Microbiology

PREVALENCE OF EXTENDED SPECTRUM BETA LACTAMASE PRODUCING UROPATHOGENS AND THEIR ANTIBIOTIC SUSCEPTIBILITY PATTERN IN PATIENTS VISITING A TERTIARY CARE HOSPITAL

KEY WORDS: ESBL ,UTI , uropathogens

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ABSTRACT

Introduction : UTI is an important cause of morbidity and mortality in both developing and developed countries of the world. Globally, there is a changing trend in the antibiotic susceptibility pattern of the Gram- negative uropathogens , which are the most important causative organisms causing UTI . This is due to production of ESBL , which causes resistance to most beta- lactam antibiotics including third- generation cephalosporins, quinolones and aminoglycosides.

Aims & objective : This study was done to find the prevalence of ESBL isolates and to study the antibiotic susceptibility patterns in uropathogens. Materials and methods : This study was conducted in the Department of Microbiology , PMCH ,Patna, from April 2018 to August 2018. All isolates were identified upto the species level . Results were interpreted according to CLSI 2018 guidelines.

Results : Out of a total of 4073 urine samples collected from male and female patients , 578 of them showed growth. Escherichia coli was reported to be maximum (55.3%), followed by Klebsiella spp.,Pseudomonas aeruginosa , Citrobacter spp. , Enterobacter spp. and Proteus spp..ESBL production was mostly prevalent in Escherichia coli followed by Klebsiella spp .

Discussion & Conclusion: This study showed a high rate of ESBL production.

Introduction :

Urinary tract infections (UTIs) are among the most common bacterial infections leading patients to seek medical care[1] and are the most common hospital-acquired infections accounting for 40% of nosocomial infections.[2] More than 80% of these infections are attributable to the use of indwelling urethral catheters.[3] The hospital environment plays an important role in determining the organisms involved in UTIs. Hospitalized patients are more likely to be infected with Escherichia, Klebsiella, Proteus, Staphylococci, Pseudomonas, Enterococci, and Candida spp.[4] These strains are more drug resistant and carry a higher morbidity and mortality index, especially for multidrug-resistant Gram-negative bacteria which produce extended-spectrum beta-lactamases (ESBLs). Originally, ESBL-producing strains were confined to hospital settings, but lately, these organisms are becoming prevalent in the community,[5] leading to high resistance rates of antimicrobials used in the treatment of UTIs worldwide and the spread of ESBLs.[6,7] ESBLs are primarily produced by the Enterobacteriaceae family of Gram-negative organisms with particular reference to Klebsiella pneumoniae, Klebsiella oxytoca, Escherichia coli, and Proteus spp.[6,8] ESBLs are also found in nonfermentative Gram-negative bacteria, such as Pseudomonas aeruginosa and Acinetobacter baumannii.[9] ESBLs are enzymes capable of hydrolyzing the penicillins, first-, second-, and third-generation cephalosporins and aztreonam but not the cephamycins or carbapenems and are inhibited by beta-lactamase inhibitors such as clavulanic acid.[7] ESBLs are often located on plasmids that are transferable from strain to strain and between bacterial species.[10] Detection of ESBL producing organism from samples such as urine may be important because this represents an epidemiologic marker of colonization, and therefore there is potential for transfer of such organisms to other patients.[1] Hence, the present study was designed to detect ESBL production among uropathogens.

Material and Methods:

This prospective study was conducted in the Department of Microbiology Patna Medical College and Hospital, Patna,from April 2018 to August 2018.

The Mid stream urine (MSU) specimens from 4073 patients were submitted to the laboratory of Department of Microbiology were received and processed for culture and sensitivity test. Wet mount to detect the presence of pus cells and bacteria was done. The Specimen were inoculated onto Blood agar and MacConkey agar and incubated at 37şC for 24 hours. A specimen was considered positive for UTI if the bacterial colony count is $>10^5$ cfu/ml. They were further processed for identification following standard operative procedures[11]. Antibiotic susceptibility test was performed by Kirby Bauer's disc diffusion method using Mueller Hinton Agar as per Clinical Laboratory Standards Institute (CLSI) guidelines and susceptibility pattern was noted[12]. The following antibiotic discs (drug concentrations in µg) were used: ceftazidime (30), ceftriaxone (30), imipenem (10) and) , Amoxicillin(30), Cefotaxime (30), Cefoperazone(75), Cefipime(30), Cefoperazone-sulbactam (75/30), Piperacillin-tazobactum (10/100), Amoxyclav (30/10), Cotrimoxazole (25), Gentamicin (10), Nitrofurantoin (300), Norfloxacin (10) and Ciprofloxacin (5), Amikacin (10), Tigecycline and fosfomycin (200)

Detection of ESBL

Detection of ESBL was done by the combined disc diffusion method using Ceftazidime and Ceftazidime/ clavulanic acid(30/10). An increase in zone size of more than 5 mm was considered as positive for ESBL production

Results and Discussion :

Out of a total of 4073 urine samples collected from male and female patients , between April 2018 to August 2018 , 578 (14.19%) urine sample yielded significant growth of Gram negative bacteria . Escherichia coli was reported to be maximum with 320 isolates (55.3%) , followed by 95 isolates (16.4%) of Klebsiella spp. , 66 isolates (11.4%) of Pseudomonas aeruginosa , 37 isolates (6.4%) Citrobacter spp., 37 isolates (6.4%) Enterobacter spp. and 23 isolates (3.97%) Proteus spp. Maximum ESBL production was observed in Escherichia coli with 174 strains (54.37%) being ESBL producers . This was followed by Klebsiella spp. with 51 strains (53.68%) being ESBL producers. In case of Pseudomonas aeruginosa , 17 strains (25.75%) were ESBL

producers. In case of Citrobacter spp., 16 strains (43.24%) were ESBL producers. 7 strains (18.91%) of Enterobacter spp. were ESBL producers. ESBL production was absent in Proteus spp.

Prevalence of ESBL production among uropathogens :

GNB	Isolates	No. of ESBL producers
Escherichia coli	320	174
Klebsiella spp.	95	51
Pseudomonas aeruginosa	66	17
Citrobacter spp.	37	16
Enterobacter spp.	37	7
Proteus spp.	23	0

Antibiotic susceptibility pattern of *E.coli*

Antibiotic	No. (%)of sensitive isolates of *E.coli*
Ampicillin	35 (10.93)
Cefotaxime	78 (24.37)
Ceftriaxone	80 (25)
Ceftazidime	93 (29.06)
Cefepime	94 (29.37)
Ciprofloxacin	67 (20.93)
Norfloxacin	64 (20)
Co trimoxazole	67 (20.93)
Nitrofurantoin	140(43.75)
Gentamycin	153(47.81)
Amikacin	226(70.62)
Amoxyclav	59(18.44)
Cefoperazone/sulbactam	176(55)
Piperacillin/Tazobactam	183(57.18)
Imipenem	283 (88.44)
Fosfomycin	320 (100)
Tigecycline	320(100)

In the present study, 578 GNB isolates from urine were included. It was observed that 265 (45.84%) isolates were ESBL producers. A higher incidence, i.e. 58% ESBL production amongst GNB isolates has been reported by other workers.13 However, the incidence of 45.84% ESBL production reported by other investigators is in accordance with the present study14. Other workers have reported lower rates of ESBL production.15,16 This geographical difference may be due to different patterns of antibiotic use and differences in the selection of organisms for the study.

Conclusion :

Inappropriate use of antibiotics has always been a threat for the emergence of MDR producing β latamases posing a greater threat to community as well as hospital acquired infections. Incidence of β latamases producing enzyme is tremendously increasing hence laboratory detection of these ESBL producing strains is becoming more important. Higher antibiotics such as Carbapenem, Tigecycline and fosfomycin should be used as reserve drug as these are still effective against ESBL producing strains. Antibotics should be used judiously. Every hospital should prepare depending upon local hospital antibiogram to curtail the over use of antibiotics its antibiotic . Morbidity and mortality rate can be reduced by the rational use of antibiotics, surveillance together with applied to strict hospital infection control policies

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