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Antibiotic Susceptibility of Gram-Negative Bacteria to Cefazolin and Cefepime in Shahidbeheshti Hospital in Kashan

[1]Alireza Sharif, [2]Mohammad Reza Sharif and [3]Javad Alizargar

[1]Department of Infectious Disease, Kashan University of Medical Sciences, Kashan, Iran
[2]Department of Pediatrics, Kashan University of Medical Sciences, Kashan, Iran
[3]Student Research Committee, Kashan University of Medical Sciences, Kashan, Iran

Abstract: Gram-negative bacteria (GNB) are common causes of lethal infections. High bacterial resistance in Shahidbeheshti hospital settings made us conduct a survey on cefazolin and cefepime resistance of GNB by disk diffusion method. Our study suggests that overall GNB resistance to cefazolin and cefepime is 59.5% and 58%. Using antibiotics such as cefazolin and cefepime should be controlled and there should be restricted policies for usage of these antibiotics for controlling antibiotic resistance.

Key words: Antimicrobial · Bacteria · Resistance

INTRODUCTION

As well as increased hospital stays and economic burden, Infections caused by resistant bacteria continue to challenge physicians and put the patients' lives in danger [1]. During the last decade, efforts to combat microorganisms focused mainly on Gram-positive bacteria and drug companies developed several novel antimicrobial agents to fight them. Unfortunately, the growing problem of antibiotic resistance in Gram-negative bacteria (GNB) was not paralleled by the development of novel antimicrobials. The return to the pre-antibiotic era has become a reality because of high antibiotic resistance in many parts of the world [2].

GNB are common causes of lethal infections in the hospitals and great deal of diseases in outpatients [3]. There are various reports in our country hospital settings that resistance rate of some antibiotics have reached dangerous limits that some antibiotics have become useless [4-7]. There are also reports in different parts of the world that resistance rate of GNB to cefazolin have been increased [8, 9]. There are similar results of GNB antibiotic resistance regarding cefepime [10, 11].

High bacterial resistance in our hospital settings, as well as limited studies regarding antibiotic resistance of GNB in Iran made us to evaluate bacterial susceptibility of GNB cultures in Shahidbeheshti Hospital in 2010-2011.

MATERIALS AND METHODS

In this retrospective study, that has been approved by Kashan University of Medical Sciences Ethical Committee, by referring to the Shahidbeheshti Hospital laboratory, cultures of Gram-negative bacteria isolated from different samples of patients admitted to the hospital from1st Jun 2010 to 1st December 2011, were identified [12]. Susceptibility of every case to cefazolin and cefepime has been added to checklists and all data were analyzed with SPSS software version 11.5. Names of the patients remained unrevealed. Antimicrobial susceptibility was evaluated according to the Clinical and Laboratory Standards Institute [12] guidelines.

RESULTS

From the 205 GNB isolates that investigated in our study and the majority was *E. coli* followed by *Klebsiella* (Figure 1). The pattern of susceptibility among samples of patients with GNB are shown in Figure 2.

Corresponding Author: Mohammad Reza Sharif, Department of Infectious Disease, Kashan University of Medical Sciences, Kashan, Iran, 5th Km-Qotb-e Ravandi Boulevard, P.O. Box: 87155.111, Kashan, Iran.
Tel: +98 913 5339790, Fax: +98 361 5579028.

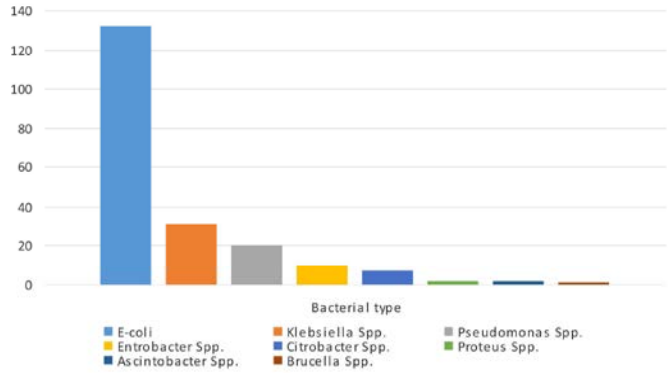

Fig. 1: Distribution of bacterial types among patients with GNB sample

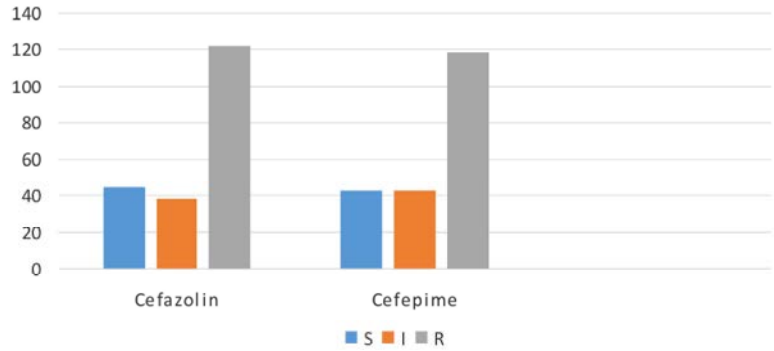

Fig. 2: Susceptibility pattern of cefazolin and cefepime among patients with GNB

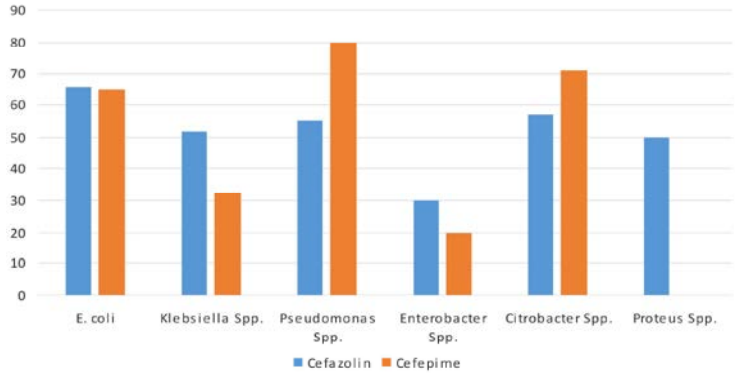

Fig. 3: Resistance rate of GNB to the tested antibiotics

Table 1: Susceptibility of different GNB to the tested antibiotics

	Cefazolin			Cefepime			
Antibiotic	S	I	R	S	I	R	Sum
E. coli	22	23	87	20	26	86	132
Klebsiella Spp.	9	6	16	16	5	10	31
Pseudomonas Spp.	4	5	11	2	2	16	20
Enterobacter Spp.	6	1	3	2	6	2	10
Citrobacter Spp.	0	3	4	1	1	5	7
Proteus Spp.	1	0	1	1	1	0	2
Acinetobacter Spp.	2	0	0	1	1	0	2
Brucella Spp.	1	0	0	0	1	0	1
Total	45	38	122	43	43	119	205

Different bacterial resistance patterns are illustrated in Table 1 and Figure 3.

DISCUSSION

Today antibiotic resistance made physicians unable to treat infections that was someday easy to treat. During the past 15 years, emergence of beta-lactam resistance in nosocomial *Enterobacteriaceae*, *Pseudomonas* and *Acinetobacter*, became a serious problem worldwide. Especially the increasing resistance to 3rd and 4th generation cephalosporins and

carbapenems is of particular concern. Gram-negative bacteria pursue various molecular strategies for development of resistance to these antibiotics [13].

Our study suggests that overall GNB resistance to cefazolin and cefepime is 59.5% and 58%. Antibiotic resistance of *E. coli, Klebsiella, Pseudomonas, Enterobacter, Citribacter, Proteus, Acinto bacter and Brucella* to cefazolin is 65.9, 51.6, 55, 30, 57.1, 50, 0 and 0% respectively. Antibiotic resistance of *E. coli, Klebsiella, Pseudomonas, Enterobacter, Citribacter, Proteus, Acinto bacter and Brucella* to cefepime is 65.1, 32.2, 80, 20, 71.4, 0, 0 and 0% respectively.

In a study that was conducted by Erdem *et al*. [14] in turkey, cefepime disseminated as the most effective antibiotic against Gram-negative isolates. Resistance to this drug was 19.3% for *P. aeruginosa* and around 0-10.6% for enteric bacteria. Enteric pathogen resistance was also ranged between 44.3-100% for cefazolin [14]. These results are much lower than the results of our study and show the high antibiotic resistance in our hospital settings. In another study by Nys *et al.* [15] prevalence of *E. coli* resistance to cefazolin was announced 12, 7, 0, 4, 13, 0, 4, 2, 25 and 18% in Venezuela, Curaçao, Mexico (urban areas), Mexico (non-urban areas), Peru, Zimbabwe, Ghana, Kenya, Philippines (urban areas) and Philippines (non-urban areas). These results are also much lower than our study and this may be attributed to the less use of such antibiotic in those developing countries. In a study in Sanandaj, Iran, out of the 255 *E. coli* isolates, 73 (28.6%) were resistant to cefepime in 2011 [16] and reported that previous treatment with cefepime to a risk factor for acquisition of a cefepime-resistant isolates.

Khalili *et al.* [17] announced the resistance rate of GNB to cefepime 60, 67.9, 37.9 and 50% in 2007, 2008, 2009 and 2010 in Iran. These results are in accordance with the results of our study may be due to high usage of this antibiotic in both study environments.

Results of our study further prove that using antibiotics such as cefazolin and cefepime should be controlled and there should be restricted policies for usage of these antibiotics if we do not want to see every day increase in these antibiotic resistances.

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