Journal of Pharmaceutical Research International

33(43A): 413-416, 2021; Article no.JPRI.73317
ISSN: 2456-9119
(Past name: British Journal of Pharmaceutical Research, Past ISSN: 2231-2919, NLM ID: 101631759)

Trends in Resistance to Cefazolin in a Military Hospital in Alkharj

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i43A32505
Editor(s):
(1) Dr. Paola Angelini, University of Perugia, Italy.
Reviewers:
(1) Troy Privette, USA.
(2) Sapna Chauhan, Muzaffarnagar Medical College, India.
Complete Peer review History: https://www.sdiarticle4.com/review-history/73317

Original Research Article

Received 02 July 2021
Accepted 30 August 2021
Published 07 September 2021

ABSTRACT

Aim: This study aimed to describe the trends in resistance to cefazolin in a military hospital in Alkharj.
Methodology: This was a retrospective study that was conducted in Alkharj to describe the trends in resistance to cefazolin from 1st of January 2020 to 30th of June 2021. The results of bacterial cultures were collected from the microbiology laboratory in the hospital.
Results: The susceptibility rate of gram negative bacteria to cefazolin in 2020 was more than 50% except *Enterobacter cloacae* (susceptibility rate=0) and that the resistance of *Escherichia coli* to cefazolin was increased from 36% in 2020 to 48% in 2021. The present study showed that cefazolin should not use to treat infections caused by *Enterobacter cloacae* because of the high resistance rate (100%).
Conclusion: The present study showed that the bacterial resistance of several pathogens to cefazolin was high. It is important to monitor antimicrobial susceptibility continuously and to use antibiotics wisely to minimize emergence of drug resistant bacteria.

Keywords: Antimicrobial susceptibility; bacterial resistance; cefazolin.

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1. INTRODUCTION

Antibiotic resistance is a worldwide health problem, and it that has reached an alarming level, mainly in developing countries [1-5]. Bacteria develop resistance to antimicrobial agents through numerous mechanisms. These include efflux mechanisms, mutations in penicillin binding proteins, the production of hydrolyzing enzymes such as extended spectrum β lactamase (ESBL) and carbapenemases, and alterations in outer membrane proteins [6]. There are other factors that increase the bacterial resistance such as poor adherence to antibiotics [7]. Bacterial resistance could lead to–a higher mortality rate, increased risk for complications, increased economic burden for society and prolonged illness [8].

Cefazolin sodium is a first-generation cephalosporin antibiotic and has been used globally since the early 1970s [9]. Cefazolin injection is used to treat numerous bacterial infections including blood, skin, genital, bone, heart valve, joint, urinary tract, respiratory tract, and biliary tract infections [10]. Cefazolin injections are also used prophylactically in surgeries to prevent infections [10]. Because cefazolin has been used for about 40 years in clinical practice, its safety and efficacy are well established compared with other antibiotics [9].

Nowadays, cefazolin no longer acts against all gram-positive cocci sufficiently, mainly due to the increase in bacterial resistance [9]. Afshari et al reported that there was increased resistance of gram-positive organisms to cefazolin and this emphasizes the need for close follow-up after initial empiric treatment [11]. Similarly, Tian et al reported that the sensitivity of *E. coli* to several antibiotics including cefazolin, cefuroxime, cefotaxime, ceftazidime, cefepime and aztreonam showed a significant downward trend from 1998 to 2017 [12].

It is important to know the bacterial resistance rate of cefazolin and other antibiotics and to share the bacterial culture results with health care professionals in different hospitals to help the physicians prescribe the appropriate antibiotics based on these results. This study aimed to describe the trends in resistance to cefazolin in a military hospital in Alkharj.

2. METHODOLOGY

This was a retrospective study conducted in a military hospital in Alkharj to describe the trends in resistance to cefazolin from 1st of January 2020 to 30th of June 2021. The results of bacterial cultures were collected from the laboratory of microbiology in the hospital.

The collected data included the number of isolates, the resistance rate of these bacteria to cefazolin in 2020 and the resistance rate in 2021. The resistance of some of the gram negative bacteria to cefazolin was not tested, so these bacteria were excluded from the study.

The descriptive data were represented by numbers and percentages.

3. RESULTS AND DISCUSSION

The susceptibility rate of gram negative bacteria to cefazolin in 2020 was more than 50% overall. However, *Enterobacter cloacae* has a 0 susceptibility rate. Table 1 shows the susceptibility rate of *Escherichia coli, Klebsiella pneumonia, Enterobacter cloacae and Proteus mirabilis* to Cefazolin in 2020.

Table 2 shows the susceptibility rate of *Escherichia coli, Klebsiella pneumonia, Enterobacter cloacae and Proteus mirabilis* to cefazolin in 2021. The susceptibility rate of gram negative bacteria to cefazolin in 2021 was more than 50% except for *Enterobacter cloacae (*susceptibility rate=0).

Table 3 shows the comparison between the resistance rate of gram negative bacteria to Cefazolin in 2020 and 2021. The results show that the resistance rate in both years is less than 50% except for *Enterobacter cloacae* (Resistance rate=100%).

Table 1. The susceptibility rate of gram negative bacteria to Cefazolin in 2020

Bacteria	Number of isolates	Susceptibility rate
Escherichia coli	416	64
Klebsiella pneumonia	190	61
Enterobacter cloacae	41	0
Proteus mirabilis	55	52

Table 2. The susceptibility rate of gram negative bacteria to Cefazolin in 2021

Bacteria	Number of isolates	Susceptibility rate
Escherichia coli	219	52
Klebsiella pneumoniae	84	71
Enterobacter cloacae	16	0
Proteus mirabilis	35	55

Table 3. Comparison between the resistance rate of gram negative bacteria to Cefazolin in 2020 and 2021

Bacteria	Resistance rate in 2020	Resistance rate in 2021
Escherichia coli	36	48
Klebsiella pneumoniae	39	29
Enterobacter cloacae	100	100
Proteus mirabilis	48	45

The present study showed that cefazolin should not use to treat infections caused by *Enterobacter cloacae* because of the high resistance rate (100%). The study also showed a high resistance rate of *Escherichia coli and Proteus mirabilis* to cefazolin (more than 40%) and that the resistance of *Escherichia coli* to cefazolin was increased from 36% in 2020 to 48% in 2021. Azimi et al reported that among major bacterial pathogens isolated from clinical specimens taken from patients in Mofid Children's Hospital, the resistance rates of *Klebsiella* spp. to cefazolin was 88.6% [13]. They also revealed that ticarcillin-clavulanic acid, ampicillin, amoxicillin-clavulanic acid, cefazolin and ceftriaxone are ineffective antibiotics against gram negative bacteria [13].

Afshari et al reviewed–data from microbiology laboratories for two consecutive annual 10-month periods and found that the resistance rate of gram-positive bacteria to cefazolin for the first versus second time interval were 13% and 23% respectively [14]. Zhou et al stated that regarding *Escherichia coli*, resistance to cefazolin was high among perioperative infections in patients with primary ovarian cancer [15]. Matsuo et al reported that pathogens responsible for urinary tract infections showed high levels of resistance to ciprofloxacin, ampicillin/sulbactam, cefazolin, and levofloxacin [16].

4. CONCLUSION

The present study showed that the bacterial resistance of several pathogens to cefazolin was high. It is important to monitor antimicrobial susceptibility continuously and to use antibiotics wisely to minimize emergence of drug resistant bacteria.

CONSENT

It is not applicable.

ETHICAL APPROVAL

The data were collected after the approval of the study by the IRB committee in the military hospital with a log number of 4101728.

ACKNOWLEDGEMENT

This Publication was supported by the Deanship of Scientific Research at Prince Sattam bin Abdulaziz University.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle4.com/review-history/73317