



The Gram-Negative Bacterial Infections in an Intensive Care Unit (ICU) of a Middle-Eastern University Hospital Remained Susceptible to Carbapenems in 2015

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ABSTRACT

The incidence of the carbapenem-resistant gram-negative bacteria is on the rise. They are common in intensive care units (ICUs) and have the potential to cause outbreaks. Currently, there are limited data regarding this phenomenon in Iran, a tropical, developing country, located in the Middle East. A cross sectional retro respective study was performed between April 2015 and October 2015, in Moheb hospital 12 bed intensive care unit, a university hospital, to investigate the prevalence of the carbapenem-resistant infections. 69 clinical specimens were collected. 37 of them were resistant to both imipenem and meropenem, which indicates a resistance rate of 53.6 per cent. we founded a carbapenem resistance rate of 53.6% in our intensive care unit. This finding is consistent with previous local published reports of resistance to the other members of carbapenem antibiotic family. According to previous studies screening for carbapenem resistant bacteria carriers in high risk units, undertake strict contact precautions for carriers and antibiotic stewardship programs to spare carbapenems is highly recommended.

Key words: Carbapenem; Resistance; Prevalence

INTRODUCTION

the incidence of the carbapenem-resistant gram-negative bacteria is on the rise[1]. They are common in intensive care units (ICUs) and have the potential to cause outbreaks[2]. There are numerous studies regarding the prevalence or incidence of carbapenem-resistant infections (CRI) and carbapenem-resistant bacteria, but most of them are in developed countries. Currently, there are limited data regarding this phenomenon in Iran, a tropical, developing country, located in the Middle East. This is a report on the prevalence of the carbapenem-resistant infections in a university hospital in Iran.

MATERIALS AND METHODS

A cross sectional retro respective study was performed between April 2015 and October 2015, in Moheb hospital 12 bed intensive care unit, a university hospital, to investigate the prevalence of the carbapenem-resistant infections. During this period, all microbiological cultures were tested for sensitivity to carbapenems by

using disk diffusion method according to the CLSI standards [3]. The presence of infection was determined according to the CDC criteria [4].

A bacteria was considered resistant to all carbapenems if it was resistant to Imipenem and Meropenem, the two available carbapenems in Iran pharmaceutical market.

RESULTS

69 clinical specimens were collected. 37 of them were resistant to both imipenem and meropenem, which indicates a resistance rate of 53.6 per cent.

Table 1 summarizes isolated germs with more than 5% in prevalence, the most common isolated bacteria was klebsiella pneumonia, followed by pseudomonas Aeruginosa

Micro-organism	Total (n) = 69		Resistant portion	Colistin sensitive
	(n)	Per cent		
<i>Klebsiella pneumoniae</i>	25	%36.2	64%	31%
<i>Pseudomonas Aeruginosa</i>	24	%34.7	50%	38%
<i>Acinetobacter baumannii</i>	11	%15.9	63.6%	38%
<i>Escherichia coli</i>	8	%11.5	25%	6%
<i>Enterococcus</i>	6	%8.6	66.6%	0%

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Table 2 represents the most common three locations of the specimens

Location	Percent's
Respiratory tract	56%
Urinary tract	30%
Blood	7%
Others	7

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Of all 37 collected carbapenem-resistant bacteria 16 samples were sensitive to colistin, current first line treatment for carbapenem resistant infections. Table 1 includes colistin sensitivity in each organism separately.

DISCUSSION

we founded a carbapenem resistance rate of 53.6% in our intensive care unit. This finding is consistent with previous local published reports of resistance to the other members of carbapenem antibiotic family. Rahimzadeh M et al showed imipenem resistance prevalence of 51.4% in infections caused by *Pseudomonas aeruginosa* in various clinical wards combined [5]. one sample t-test showed insignificant difference comparing the means (p -value=0.71) though we expected a higher rate of resistance to carbapenem in this study, as it included only ICU, which according to prior reports ICUs are areas where resistance problems are the greatest [6].

Data regarding prevalence and incidence of carbapenem resistant infections and colonization are both scarce and vary greatly. First Results from the national nosocomial infection surveillance system (KISS) in Germany detected that 16% of multidrug-resistant organisms isolated in ICUs are insusceptible to carbapenem, but a same study performed in previous year to that in Germany, reported a prevalence four times that of KISS[7].

In a clinical trial done by Gibson et al reported a 40% cure response with high dose Colistin, which is very close to the colistin sensitivity in vitro found in this study.

Previous studies have shown us ways to reduce incidence of carbapenem resistant infections. These includes screening for carbapenem resistant bacteria carriers in high risk units, undertake strict contact precautions for carriers and antibiotic stewardship programs to spare carbapenems [8,9,10].

In conclusion no place on earth is an antibacterial resistance exemption and to tackle this potentially life threatening challenge properly, emergent measures have to be taken globally, starting from every small and remote health care facilities around the world, no matter how trivial their commitment and efforts may seem.

CONCLUSION

In conclusion no place on earth is an antibacterial resistance exemption and to tackle this potentially life threatening challenge properly, emergent measures have to be taken globally, starting from every small and remote health care facilities around the world ,no matter how trivial their commitment and efforts may seem.

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REFERENCES

- [1] Freeman, R., et al. "Exploring the epidemiology of carbapenem-resistant Gram-negative bacteria in west London and the utility of routinely collected hospital microbiology data." *Journal of Antimicrobial Chemotherapy* 70.4 (2015): 1212-1218.
- [2] Maechler, F., et al. "Prevalence of carbapenem-resistant organisms and other Gram-negative MDRO in German ICUs: first results from the national nosocomial infection surveillance system(KISS)." *Infection* 43.2 (2015): 163-168.
- [3] Clinical and Laboratory Standard Institute. Performance standards for antimicrobial susceptibility testing. 18th informational supplement. M100-S18. Wayne, PA: CLSI; 2008.
- [4] Centers for Disease Control and Prevention (CDC). "CDC/NHSN surveillance definitions for specific types of infections." CDC, Atlanta (2014): 1-24.
- [5] Rahimzadeh M, Moosavian M, Shoja S. Determination of Pseudomonas Aeruginos Producing Metallo-Beta-Lactamases Isolated from Clinical Specimens by Imipenem-EDTA Combined Disk Method in Ahwaz, Iran. *ZUMS Journal*. 2013; 21 (87) :73-82
- [6] Samsó, Enric, et al. "Bugs, hosts and ICU environment: countering pan-resistance in nosocomial microbiota and treating bacterial infections in the critical care setting." (2013).
- [7] Maechler, F., et al. "Prevalence of carbapenem-resistant organisms and other Gram-negative MDRO in German ICUs: first results from the national nosocomial infection surveillance system (KISS)." *Infection* 43.2 (2015): 163-168.
- [8] Nicolau, David P., et al. "Carbapenem stewardship: does ertapenem affect Pseudomonas susceptibility to other carbapenems? A review of the evidence." *International journal of antimicrobial agents* 39.1 (2012): 11-15.
- [9] Yoon, Young Kyung, et al. "Effects of Group 1 versus Group 2 carbapenems on the susceptibility of Acinetobacter baumannii to carbapenems: a before and after intervention study of carbapenem-use stewardship." *PloS one* 9.6 (2014): e99101.
- [10] Viale, P., et al. "Impact of a hospital-wide multifaceted programme for reducing carbapenem-resistant Enterobacteriaceae infections in a large teaching hospital in northern Italy." *Clinical biology and Infection* 21.3 (2015): 242-247.