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**ORIGINAL ARTICLE**

# Comparison between Hospital Stay and Carbapenem Use in Patients with Carbapenem Resistant Infection of a Middle-Eastern ICU with Other Centers

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**Abstract:** Socioeconomic and Behavioral Factors in developing countries leads to bacterial resistance to antibiotics. In this Study we investigated hospital stay and prior carbapenem use in patients with carbapenem resistant infections. Hospital stay and prior carbapenem use were studied in 80 patients with carbapenem resistant infections admitted to a university affiliated hospital in Iran. results were compared with other centers in developed countries. Compared to the other centers Mean days of hospital stay was significantly shorter ( $p$ <0.01 , (15.1 ±14.9 days) Vs. (23.8±.3 days)) and a significant higher percent of patients have history of carbapenem use. (68.8% vs 49.4% , $p$ = 0.00). we are facing carbapenem resistant infections in shorter hospital stay and a significantly higher percents of them have history of carbapenem administration.

## Introduction

Carbapenem antibiotics have an important antibiotic place in that they retain activity against the chromosomal cephalosporinases and extended-spectrum beta-lactamases found in many gram-negative pathogens. The emergence of carbapenem-hydrolyzing beta-lactamases has threatened the clinical utility of this antibiotic class and brings us a step closer to the challenge of "extreme drug resistance" in gram-negative bacilli (Quale, 2015). Resistance to carbapenem is also associated with an additional cost of hospitalization (Lemos et al,2014). Many studies have been carried out to recognize risk factors which lead to resistance to carbapenems .Recently a systematic review and meta-analyses published by Voor, Anne F. et al. demonstrated that carbapenem use and medical devices are the leading risk factors for carbapenem resistance. Other risk factors mentioned include hospital stay (Voor et al, 2014).

A prospective Multicenter study in Intensive Care Units (ICU) did not show significant difference between carbapenem use in Iran and southern Europe (Erdem et al, 2014).

The goal of this study is to compare hospital stay and prior carbapenem use two well-recognized factors predisposing to carbapenem resistance,in an ICU located in middle east , with Intensive Care Units elsewhere.

## Materials And Methods

### Study design

A cross-sectional analytic study was performed between April 2015 and September 2015 to determine hospital stay and prior use of carbapenem before the isolation of first carbapenem resistant strain in 12 bed general ICU of Moheb hospital a university affiliated hospital located in central Tehran and capital city of Iran.

### Data collection

Demographics data including age , gender and known risk factors from same previous studies including hospital stay and antibiotics regiment was collected from medical records of all patients with carbapenem resistant isolate (Voor et al, 2014).

To obtain mean hospital stay prior to isolation of the first carbapenem resistant strain 2 systematic review and meta analysis corresponding author were contacted of whom 1 did not responded and the other one did not provided us with requested information hence we reviewed hospital stay and carbapenem use prior to isolation of first carbapenem resistant strain of 13 studies. 6 of them did not specified the hospital stay, instead of that they have reported length of ICU stay as well as one study which reported median days of hospitalization Finally 6 studies were included for comparison (Deris et al, 2011. Zheng et al, 2013. Aydemir et al, 2012. Kim et al, 2012. Huang et al, 2012. Sheng et al, 2010).

### Definitions

Carbapenem resistance was defined according to Clinical and Laboratory Standards Institute (CLSI) guidelines (CLSI, 2009).

Prior use of carbapenem was defined as receiving carbapenem within the last 28 days of

resistant strain isolation. Hospital stay was defined as the number of the days stayed in the hospital before isolation of the first carbapenem resistant strain.

**Statistical analysis**

The results were expressed by number, percentage or mean. Kolmogorov–Smirnov test was run to check variables distribution. The difference between means was tested using one sample t-test . Demographic characteristics were tested by non parametric chi-square test. The p-value of lower than .05 was considered significant. All data analysis were done using R software version 3.2.2.

**Results**

The hospital stay and prior carbapenem use of previous studies are summarized in table-1. Weighed mean of hospital stays was 23.8±.3 days and weighed mean percentage of carbapenem use was 49.4%±.5.

Table 1. Hospital stay and prior carbapenem use of previous studies

| study | Number of patients with carbapenem resistant isolate | mean hospital stay in days | Prior Carbapenem use in percentage |
|---|---|---|---|
| Deris et al. | 15 | 14.7 | 26.7 |
| Zheng et al. | 97 | 17.7 | 59.8 |
| Aydemir et al. | 110 | 18.1 | 32.7 |
| Kim et al. | 95 | 30.2 | 49.1 |
| Huang et al. | 62 | 35.8 | 54.8 |
| Sheng et al. | 91 | N/A | 59.3 |

**Patient characteristics**

A total of 80 patients with carbapenem resistant isolates were included in this study. The characteristics of the patients are listed in Table-2. the mean age of patients was 65.4±19.1 years. there was no significant sex difference among the patients (p=1.00).

Table 2. Demographics and clinical characteristics of patients

| variable | | Frequency(%)/ Mean (sd) |
|---|---|---|
| | | N=80 |
| Gender | | |
| | Male | 40 |
| | Female | 40 |
| Age(y) | | 65.4(19.1) |
| Hospital stay | | 39.45 |
| Antibioc use | | |
| | carbapenem | 55(68.8%) |
| | cefepim | 31(38.8%) |
| | cephalosporin | 43(53.8%) |
| | Beta lactams | 23(29.1%) |
| | aminoglycoside | 18(22.8%) |

**Hospital stay**

After removing outliers, Mean hospital stay of this study was 15.1 ±14.9 days. Compared to the hospital stay of previous studies (mean 23.8±.3 days) one sample t-test showed significant difference between them (p<.01). see figure-1.

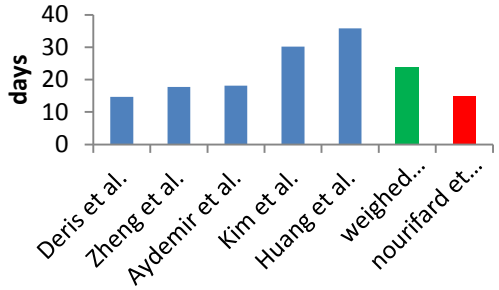


Figure 1. mean hospital stay

**Prior carbapenem use**

55 patients out of 80 had prior use of carbapenem (68.8%). One sample t-test showed significant difference (p=.00)between this study and weighed mean percentage of previous studies (49.4%±.5). see figure-2.

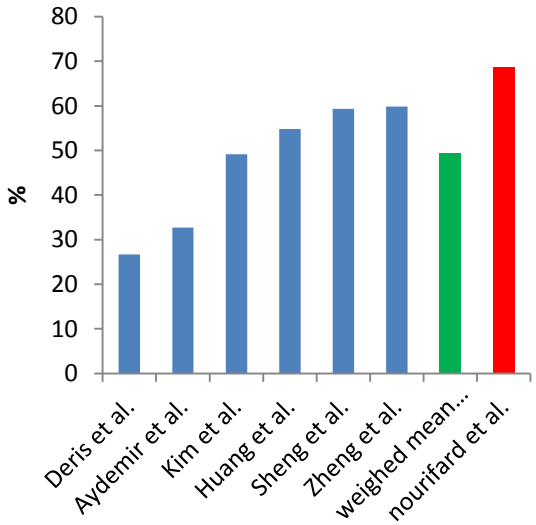


Figure 2. percentage of carbapenem use

**Discussion**

Previous studies have shown different factors leading to carbapenem resistance. It seems there is a strong association between hospital stay and acquisition of carbapenem resistant infections (Voor et al, 2014. Ahn et al, 2014). According to these studies if hospitalization last longer carbapenem resistance occures. In this study we saw a shorter interval between hospital admission and a carbapenem resistant infection in this Middle Eastern ICU compared with others. There is no study that compares hospitalization period of carbapenem resistant infected patients of developing countries and developed ones. A similar studies by Nouira S et al showed patients in developing countries have shorter ICU stay compared to developed countries partly due to the significantly higher mortality rate observed in the developing countries ICU (Nouria et al, 1998). carbapenem resistance is also associated with increased mortality (Zheng et al, 2013). These finding are suggestive of a vicious cycle.

Although Ho CM et al found no association between carbapenem consumption and its resistance, numerous studies summarized by Voor et al showed that prior carbapenem usage is a leading risk factor for carbapenem resistance (Ho et al, 2012. Ahn t al, 2014). Results of current study showed that a greater portion of evaluated patients with carbapenem resistant infection had a positive history of carbapenem consumption before, raising the concern for inappropriate carbapenem use. This phenomena may be due to socioeconomic and behavioral factors leading to acquired bacterial resistance to antibiotics in developing countries as described by Alp et al and Okeke et al or poor infections control measurements in developing countries found by Firth P et al (Alp et al, 2011. Okeke et al, 1999, Firth et al, 2012). these findings are in contrast with Erdem et al who did not find significant differences between carbapenem use in Iran and multiple centers in Europe (Erdem et al, 2014). Thus further studies are suggested to compare carbapenem usage in Iran with different countries.

Limitation of this study includes the differences between severity of illness of patients

among centers and limited data of other hospitals in Iran.

Further studies due to lack of data comparing hospital stay and carbapenem use in developing countries with developed countries are highly needed.

In conclusion we are facing carbapenem resistant infections in shorter hospital stay and a significant portion of them have history of carbapenem use, substantiating the need for re-evaluating infection control measurements.

**References**

Ahn JY, Song JE, Kim MH, Choi H, Kim JK, Ann HW, Kim JH, Jeon Y, Jeong SJ, Kim SB, Ku NS. 2014, Risk factors for the acquisition of carbapenem-resistant Escherichia coli at a tertiary care center in South Korea: a matched case-control study. American journal of infection control. 42(6):621-625.

Alp, Emine, et al. 2011, Infection control practice in countries with limited resources."Ann clin microbiol Antimicrob 10.1: 36.

Aydemir, Hande, et al. 2012, Mortality attributable to carbapenem-resistant nosocomial Acinetobacter baumannii Infections in a Turkish University Hospital. Japanese journal of infectious diseases 65.1: 66-71.

Clinical and Laboratory Standards Institute. 2009. Performance standards for antimicrobial susceptibility testing, p. M100-S19. Clinical and Laboratory Standards Institute, Wayne, PA.

Deris, Zakuan Zainy, Mohd Nazri Shafei, and Azian Harun. 2011, Risk factors and outcomes of imipenem–resistant Acinetobacter bloodstream infection in North–eastern Malaysia. Asian Pacific journal of tropical biomedicine 1.4: 313-315.

Erdem, Hakan, et al. 2014, Surveillance, control and management of infections in intensive care units in Southern Europe, Turkey and Iran–a prospective multicenter point prevalence study. Journal of Infection 68.2: 131-140.

Firth P, Ttendo S. 2012, Intensive care in low-income countries e acritical need. N Engl J Med;367(21):1974e6

Ho CM, Ho MW, Liu YC, Toh HS, Lee YL, Liu YM, Huang CC, Lu PL, Liu CE, Chen YH, Ko WC. 2012, Correlation between carbapenem consumption and resistance to carbapenems among Enterobacteriaceae isolates collected from patients with intra-abdominal infections at five medical centers in Taiwan, 2006–2010. International journal of antimicrobial agents. 40: 24-28.

Huang, Shih-Tse, et al. 2012, Risk factors and clinical outcomes of patients with carbapenem-resistant Acinetobacter baumannii bacteremia." Journal of Microbiology, Immunology and Infection 45.5: 356-362.

Kim, Youn Jeong, et al. 2012, Risk factors for mortality in patients with carbapenem-resistant Acinetobacter baumannii bacteremia: impact of appropriate antimicrobial therapy. Journal of Korean medical science 27.5: 471-475.

Lemos, E. V., et al. 2014, Impact of carbapenem resistance on clinical and economic outcomes among patients with Acinetobacter baumannii infection in Colombia. Clinical Microbiology and Infection 20.2: 174-180.

Nouira S, Roupie E, El Atrouss S, Durand-Zaleski I, Brun-Buisson C, Lemaire F, Abroug F. 1998, Intensive care use in a developing country: a comparison between a Tunisian and a French unit. Intensive care medicine. 24(11):1144-1151.

Okeke, Iruka N., Adebayo Lamikanra, and Robert Edelman. 1999, Socioeconomic and behavioral factors leading to acquired bacterial resistance to antibiotics in developing countries. Emerging infectious diseases 5.1: 18.

Quale J. 2015, Carbapenemases. In: Post T, ed. UpToDate. Waltham, Mass.: UpToDate; 2014. www.uptodate.com.

Sheng, Wang-Huei, et al. 2010, A multicenter study of risk factors and outcome of hospitalized patients with infections due to carbapenem-resistant Acinetobacter baumannii. International Journal of Infectious Diseases 14.9: 764-769.

Voor, Anne F., et al. 2014, A systematic review and meta-analyses show that carbapenem use and medical devices are the leading risk factors for carbapenem-resistant Pseudomonas aeruginosa. Antimicrobial agents and chemotherapy 58.5: 2626-2637.

Zheng, Yu-long, et al. 2013, Risk factors and mortality of patients with nosocomial carbapenem-resistant Acinetobacter baumannii pneumonia. American journal of infection control 41.7: 59-63.