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ORIGINAL ARTICLE

Prevalence of vancomycin resistant Enterococci colonization in gastrointestinal tract of hospitalized patients

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ABSTRACT

Background: Vancomycin-resistant Enterococci (VRE) are the most common nosocomial pathogen worldwide. Colonization with VRE can lead to serious infection, some of which e.g. VRE sepsis can be fatal. Because VRE are dangerous important pathogens, we aimed to determine the prevalence of VRE among patients admitted in infectious, ICU and surgery wards in a referral teaching hospital in Isfahan, Iran.

Patients and methods: A total of 100 patients from infectious, ICU and surgery (post- operative patients) wards were selected by simple sampling method. Stool specimens were taken from the patients and cultured in VRE selective media (bile- esculin agar plate with 6 µg/ml of vancomycin) and gram positive cocci from black colonies were inoculated to the tryptase soya broth plus 6.5% NaCl and again gram positive cocci were inoculated to bile-esculin and finally MIC (minimal inhibitory concentration) evaluated by E-Test for detection of VRE.

Results: Totally 58 out of 100 patients had positive cultures for enterococci. Among them 16 out of 58 were female (27.6%) and 42 (72.4%) were male. Of 58 positive cultures, 17 (29.3%) were highly resistant to vancomycin. There was significant relation between previous antibiotic therapy especially vancomycin and VRE in this study (P=0.02). Most of the patients (74.1%) with negative cultures for Enterococci had GI surgery. Most of culture positive patients (46%) were from infectious ward. There was no significant relation between VRE and sex, GI surgery and admission ward in this study.

Conclusion: Results of this study suggest that previous antibiotic therapy especially vancomycin and B-lactam is a major risk factor for colonization with VRE. Prevalence of VRE in our study was high. This problem is very important in epidemiology of hospital infections. Considering the fact that there is no substitute agent for vancomycin in our country, it is necessary to determine guidelines regarding treatment with antibiotics specially vancomycin.

Keywords: *Aspergillus fumigatus, Asthma, Seroprevalence*.
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INTRODUCTION

Vancomycin resistant Enterococci (VRE) are one of the most important nosocomial pathogens worldwide (1). VRE were isolated in 1986 in Europe for the first time and then in 1987 in the United States (2). Thereafter, prevalence of VRE increased all over the world. According to the reports from Centers for Disease Control and prevention (CDC), prevalence of VRE in the United States increased 20-fold between 1989 and 1993 (3). Different studies have reported Enterococci which were dependent to vancomycin for growth (4). VRE are known as the second most common cause of nosocomial infections in the

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United States and are responsible for about 8 % of all nosocomial bloodstream infections (5). Colonization with VRE can lead to serious diseases like urinary tract infections, bacteremia, and endocarditis which many of them such as VRE sepsis can be fatal. Findings of a prospective study showed that the patients with VRE had higher mortalities, morbidities, and caused more costs compared with the patients without this kind of infection (6).

The study of Kalocheretis et al has shown that previous administration of vancomycin, especially in patients with nosocomial infections can influence the acquisition of VRE that is easily transferable from patient to patient (7). According to the study of Fridkin et al, the higher administration of vancomycin and third generation cephalosporins can increase the prevalence of VRE in intensive care units (ICUs) and decrease in use of these medications can reduce the prevalence of VRE in ICUs VRE have prolonged survival on hands, gloves, and environmental surfaces that can be transmitted to patients (8).

As there is no effective antimicrobial treatment for VRE infections, decrease in infection with VRE, is an important factor for VRE- induced mortality and morbidity control (9).

Donskey et al study has shown that treatment with anti anaerobic antibiotics in patients with VRE colonization in stool, can promote high-density colonization (10). It seems that the high rate of VRE colonization (the population of VRE colonized patients), is an important factor in infection control (11).

Previous studies have shown that intestinal colonization of VRE depends on geographic factors (7). As the geographic pattern of VRE prevalence varies in different societies and the prevalence of VRE as a health marker for infection control in hospitals has not been investigated in Isfahan, we decided to study the prevalence of VRE colonization in the gastrointestinal tracts of hospitalized patients in a referral teaching hospital in Isfahan.

PATIENTS and METHODS

After obtaining local Research Ethics Committee approval, this cross-sectional study was conducted in a referral teaching hospital in Isfahan. The study continued for 3 month from August to October 2006. A total of 100 cases were chosen by simple sampling method in ICU, surgery (post operative patients) and Infectious wards. Inclusion criteria were designated as hospitalized patients in ICU, infectious and surgery wards of hospital with at least 4 days history of admission.

Complete records of the subjects were studied together with full examination for each of them and then a brief questionnaire was filled including name, name of the ward, age, sex, previous history of antibiotic therapy, date of operation (for the patients of surgery ward), history of gastrointestinal surgery and level of consciousness. Specimens were transferred to the hospital laboratory and inoculated into bile-esculin agar plates with 6 µg/ml of vancomycin (selective media for VRE).

Plates were incubated at 35^{o}C for 24-48 hours. Then gram staining was performed for brown or black colonies. The recovered gram positive cocci were inoculated in to trypticase soya broth plus 6.5% NaCl and incubated at 35^{o}C for 2-4 hours. Then gram positive cocci were inoculated to the VRE selective media and incubated for 24 hours and after that brown and black colonies inoculated into Mueller-Hinton agar and then MIC was determined by E-Test.

MIC<4 considered as sensitive to vancomycin, MIC between 4-24 considered as intermediate resistant to vancomycin, MIC≥32 considered as resistant to vancomycin and MIC=256 considered as highly resistant. Data were analyzed with SPSS (Version 13) software using chi-square and ANOVA tests.

RESULTS

Totally 58 out of 100 patients had positive cultures for Enterococci. Sixteen out of 58 were female (27.6%) and 42 were (72.4%) male. According to the MIC, culture positive patients were grouped into: 27 (46.6%) patients were sensitive to vancomycin (group 1), 14 (24.1%) with intermediate resistance to vancomycin (group 2) and 17 (29.3%) with highly resistant to vancomycin (group 3). The minimum age for the patients with highly resistant enterococci was 18 years and the maximum age was 71. The minimum duration of hospitalization in patients with highly resistant cultures was 6 days and the maximum duration was 24 days. These results showed that frequency of VRE among our selected patients was about 29.3%.

Table 1. Frequencies of culture positive patients according to base-line characteristics

Base- line characteristics	Frequency
Sex	
Female	16 (27.6%)
Male	42 (72.4%)
GI Surgery	
No	43 (74.1%)
Yes	15 (25.9%)
Antibiotics	
No Antibiotics	8 (13.8%)
β-Lactam	42 (72.4%)
β -Lactam+Vancomycin	8 (13.8%)
Ward	
Surgery	13 (22.4%)
Infectious Diseases	31 (53.4%)
ICU	14 (24.1%)
MIC Group	
Sensitive	27 (26.6%)
Intermediate	14 (24.1%)
Very resistant	17 (29.3%)

Table 1 shows the frequency of patients with positive cultures for Enterococci according to sex, GI surgery, admission service, previous antibiotic administration and MIC in positive culture group (MIC group). There was not significant correlation between sex and culture results. No significant relation between age, and duration of hospitalization with VRE, was seen in this study. Also there was no significant association between admission service and culture results in patients in different wards. But there was a significant correlation between culture results and GI surgery in this study (P=0.02). 74.1% of patients with negative culture results for Enterococci had GI surgery (figure 1).

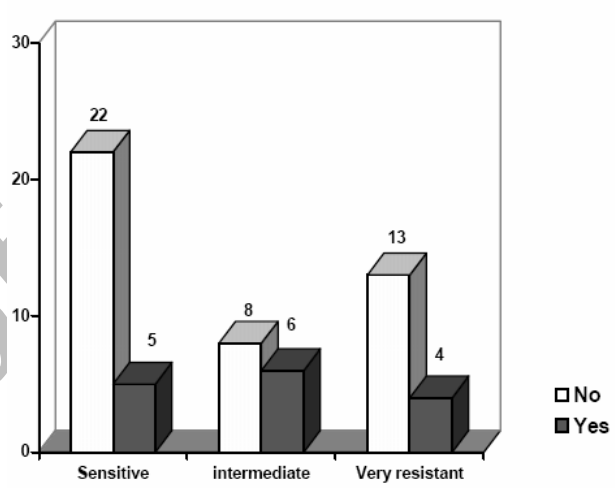

Figure 1. MIC groups according to GI surgery

There was no significant relation between sex and MIC groups (in positive cultures) in our study.

From 58 patients in 3 MIC groups, 42 (72.4%) had received B- lactam and 8 (13.8%) had not received any antibiotics. Significant relation between previous antibiotic administration and VRE (in positive cultures) was observed in this study (P=0.04) (figure 2).

Thirty one (53.4%) out of 58 culture positive patients were from infectious ward and also in all of the 3 MIC groups, most patients were from infectious ward, but no significant relation was seen between MIC groups and patients from different wards. Forty three (74.1%) from 58 patients in 3 MIC groups had GI surgery but there was no significant relation between MIC groups and history of GI surgery.

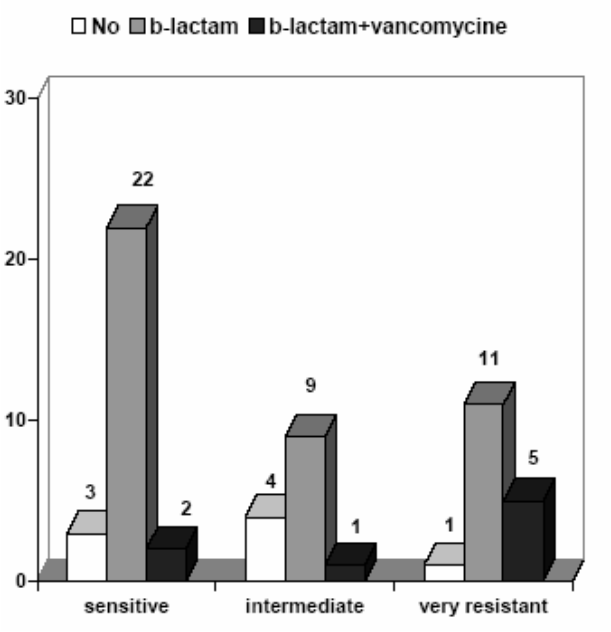

Figure 2. MIC Group according to antibiotic type

DISCUSSION

In this study the overall prevalence of VRE among 100 hospitalized patients in infectious, ICU and surgery wards was about 29.3%. The related studies have been reported different rates of prevalence according to sample size, age, sex and methods.

The study of Gambarotto et al showed that prevalence of VRE in hematology patients was about 37% (12).

The rate of VRE colonization varies widely in different studies. In Wisplinghoff et al study vancomycin resistance was seen in 2% of Enterococcous fecalis and in 60 of Enterococcous faecium cultures (13). Although in our study no significant relation between gender and VRE was seen but Kalocheretis et al study showed a significant relation between male gender and VRE in hemodialysis patients (P=0.01) (7). This difference may be due to different sample size. In our study most patients (72.4%) with positive cultures for Enterococci (both sensitive and resistant to vancomycin) had received B-lactam antibiotics and 13.8% of culture positive patients had received B-lactam plus vancomycin. Significant relation was seen between previous antibiotic usage and VRE colonization (p=0.04). In another study vancomycin exposure was significantly associated with VRE colonization (14).

In the study of Kalocheretis et al significant relation between previous administration of antibiotics and VRE was reported (P=0.02) (7).

Martinez et al study showed significant relation between antibiotic usage (vancomycin, cephalosporin, metronidazol, quinolons) and VRE (15). Fridkin et al demonstrated that higher rates of vancomycin or third-generation cephalosporins usage were significantly associated with higher prevalence of VRE (8). The above results are similar to our study but there are some studies inconsistent with these results. Gambarotto et al have reported no significant relation between VRE and previous vancomycin or cephalosporin administration (12). These different results in older studies may be due to old laboratory techniques which failed to detect VRE.

Present study showed significant relation between GI surgery and growing of Enterococci. A total of 74.1% of the patients with positive culture for Enterococci had no GI surgery, but on the other hand no significant correlation between VRE (in positive cultures) and GI surgery was seen in our study. Although in this study majority of culture positive patients were from infectious ward, no significant relation between VRE and ward was detected. We were not able to determine any relation between the number of days of hospitalization and VRE.

We had limitations in our study such as small sample size, short duration of study, and inability to detect different strains of Enterococci.

We can conclude that that prevalence of VRE among our hospitalized patients is considerably high and our data suggest prior antibiotic therapy

especially with vancomycin may be an important risk factor for colonization with VRE.

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