Vancomycin-resistant *Enterococci.* *Prevalence and risk factors for fecal carriage in patients at tertiary care hospitals*

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Enterococci are intrinsically resistant to many antimicrobial agents and have acquired resistance to commonly used agents, including ampicillin and aminoglycosides. Gylcopeptide antibiotics (including vancomycin) are the main option for treating multi-resistant enterococcus isolates. However, vancomycin-resistant enterococci (VRE) are becoming a major concern in medical practice.[1] The VRE fecal colonization, which may last for long periods can precede infection and colonized patients may provide a reservoir for enterococci, which may cross-colonize and cause infection in other patients.[2] In the present study our aim was to investigate the prevalence of VRE intestinal colonization among hospitalized patients as an important component of preventing further transmission.

In a retrospective analytical study, we studied 157 patients hospitalized in 3 different hospitals in Makkah, Kingdom of Saudi Arabia. A total of 157 rectal swabs were collected from randomly selected asymptomatic inpatients at intensive care units (ICU) (49 samples), medical wards (83 samples), surgical (20 samples) and orthopedic wards (5 samples) from 3 hospitals in Makkah, Kingdom of Saudi Arabia between March and April 2007. The specimens were transported to the Research Laboratory at the Faculty of Medicine, Umm Alqura University, cultured on bile esculin agar for presumptive identification of enterococci and examined for brown colonies with blackening of the plated medium after 24 and 48 hours. Positive cultures were further identified using Gram stain and pyrrolidonyl arylamidase activity which differentiate between *Enterococcus soecies* and *Streptococcus bovis*.

Vancomycin susceptibilities were determined using 30µg/ml vancomycin disks in accordance with the guidelines of the Clinical and Laboratory Standards Institute.[3] Risk factors for colonization such as admission to high-risk hospital wards, length of hospitalization, and use of multiple antibiotics, including vancomycin and cephalosporins, were assessed. The significance of the influence of these factors on the prevalence of VRE colonization was tested using Fisher's exact test (SPSS Version 19). This work was approved by the Ethical Committee of the Faculty of Allied Sciences, Umm Al Qura University.

The results showed that 89 of the 157 patients harbored Enterococci in their intestinal tract. Of the 89 positive specimens, 26 isolates were from ICU, 48 were from medical wards, 12 were from surgical wards, and 3 were from orthopedic surgery wards. Seven patients (3 ICUs isolates and 4 medical wards isolates) were colonized with VRE (minimum inhibitory concentration > 32 µg/ml). All patients colonized with VRE had been in hospitals for periods of 2 months to 2 years. They had all been treated with several courses of antibiotics including third generation cephalosporins, clindamycin, and 3 of them were also treated with vancomycin.

Table 1 - Vancomycin-resistant enterococci carriage: analysis of risk factors, duration of hospital stay, location of the patient, and antibiotic treatment.

Variable	Total number of patients	VRE positive	Significance (*P*-value)*
ICU (n=89)			
Yes	26	3	0.33
No	63	4	
MW (n=89)			
Yes	49	4	0.61
No	40	3	
Duration of hospitalization ≥ 2 months (n=89)			
Yes	19	7	<0.01
No	70	0	
Antibiotic use (n=89)			
Yes	46	7	0.01
No	43	0	
Vancomycin (n=46)			0.38
Yes	12	3	
No	34	4	
Multiple antibiotics (n=46)			0.03
Yes	26	7	
No	20	0	

* Fisher's exact test, ICU - intensive care unit, MW - medical ward, VRE - vancomycin-resistant *Enterococci*

Using Fisher's test, prolonged hospitalization, prior treatmentwith multiple antibiotics, including cephalosporins and/or vancomycin, emerged as significant risk factors for VRE carriage (**Table 1**). These factors have been shown previously as significant risk factors for VRE carriage.[4] However, wards in which patients were admitted, identified in pervious studies as risk wards such as ICUs, did not have a significant impact on VRE fecal colonization in our study (**Table 1**). This may be explained by the fact that the location of the patient per se is not a risk factor, but factors such as co-morbidities, immunosuppression, and excessive use of antibiotics in certain wards may be important in increased rates of VRE carriage.[5]

In conclusion, our study showed that the most important risk factors for fecal carriage of VRE were: prior treatment with multiple antibiotics, including cephalosporins and/or vancomycin, and duration of hospital stay. We hence recommend prudent vancomycin and cephalosporins use, early detection, and prompt reporting of VRE for preventing the spread of vancomycin resistance. Our findings may be further investigated by prospective cohort studies of a larger number of patients exposed to the risk factors identified.

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References

1. Werner G, Coque TM, Hammerum AM, Hope R, Hryniewicz W, Johnson A, et al. Emergence and spread of vancomycin resistance among enterococci in Europe. ***Euro Surveill*** 2008; 13: 19046.
2. Kuzucu C, Cizmeci Z, Durmaz R, Durmaz B, Ozerol IH. The prevalence of fecal colonization of enterococci, the resistance of the isolates to ampicillin, vancomycin, and high-level aminoglycosides, and the clonal relationship among isolates. ***Microb Drug Resist*** 2005; 11: 159-164.
3. Clinical and Laboratory Standards Institute. Performance standards for antimicrobial susceptibility testing. Fifteenth informational supplement. Document M100-S15. Philadelphia (PA): Wayne, CLSI; 2005.
4. Yildirim M, Sencan I, Ozdemir D, Oksüz S, Yilmaz Z, Sahin I. [Vancomycin and high-level aminoglycoside resistant Enterococcus carriage and the risk factors related to resistance in hospitalized patients]. ***Mikrobiyol Bul*** 2007; 41: 271-277. Turkish
5. Fridkin SK, Lawton R, Edwards JR, Tenover FC, McGowan JE Jr, Gaynes RP. Monitoring antimicrobial use and resistance: comparison with a national benchmark on reducing vancomycin use and vancomycin-resistant enterococci. ***Emerg Infect Dis*** 2002; 8: 702-707.