Indian J Med Res 149, January 2019, pp 71-73
DOI: 10.4103/ijmr.IJMR_2063_16

Quick Response Code:

# Correspondence

## Vancomycin-resistant enterococci & healthcare-associated risk factors in paediatric intensive care unit

Sir,

Vancomycin-resistant enterococci (VRE) species are major nosocomial pathogens with limited therapeutic options due to their high antimicrobial resistance[1]. Further, VRE has remarkable abilities to transfer vancomycin resistance to other bacteria (including methicillin-resistant *Staphylococcus aureus*) and to cause hospital outbreaks[2]. It is important to recognize colonization of VRE in patients as clinical infection is almost always associated with faecal colonization with this organism and is usually completely asymptomatic[3-5].

In the Western world, VRE screening is performed routinely particularly in high-risk patients along with aggressive infection control measures. However, in resource-limited countries, policies regarding the detection and management of VRE-infected or colonized patients are not stringent. The epidemiology of VRE varies from one hospital to another and this mandates the need to screen for VRE carriage in different hospitals in specified geographical region[6].

The present study was conducted in the department of Microbiology, Government Medical College and Hospital, Chandigarh, India, after getting due approvals by the Institutional Ethics Committee. The purpose of this study was to detect the gastrointestinal carriage of VRE among paediatric patients (age ≤5 yr) admitted in ICU and to determine healthcare-associated risk factors. Rectal swabs from 65 children (39 males and 26 females) from neonatal and paediatric ICU who were hospitalized for longer than 48 h were screened for gastrointestinal carriage of VRE between August 2015 and July 2016. Baseline demographic data, prior antibiotic usage and history of hospitalization were recorded for each patient. Culture was done regardless of clinical diagnosis of the patient.

Rectal swab was inoculated into brain heart infusion broth supplemented with vancomycin at a concentration of 6 µg/ml. The broth was incubated for 24 h following which a loopful was subcultured onto bile esculin agar plates (HiMedia, Mumbai), a selective media used for bacterial isolation[7,8]. All plates were incubated at 37°C, examined daily and held for 48 h before being considered negative. Colonies were subcultured to MacConkey agar. A presumptive identification of *Enterococcus* was made based on colony morphology, Gram staining, catalase reaction, bile esculin test and growth in 6.5 per cent NaCl. *Enterococcus faecium* and *E. faecalis* were differentiated based on mannitol fermentation, arginine deamination, growth on potassium tellurite agar, sorbitol and arabinose fermentation[9]. VRE was presumptively identified by growth on VRE screen agar (with 6 µg/ml vancomycin) and confirmed by minimum inhibitory concentration (MIC) to vancomycin using vancomycin E-strips (AB Biodisk, Solna). *E. faecalis* ATCC 29212 (vancomycin susceptible) and *E. faecalis* ATCC 51299 (vancomycin resistant) were used for quality control. According to Clinical and Laboratory Standards Institute (CLSI) guidelines, MIC breakpoints were as follows: ≤4 µg/ml for sensitive, from 8 to 16 µg/ml for intermediate and ≥32 µg/ml for resistant[10]. Interpretations of disc diffusion test using vancomycin disc (30 µg) were as follows: resistant if zone diameter ≤14 mm, intermediate if zone diameter 15-16 and susceptible if zone diameter ≥17 mm[10].

Of the 65 patients, a total of 28 enterococci were obtained after enrichment. Of these, 23 were VRE; four were identified as *E. faecium*, and the remaining 19 were identified as *E. faecalis*. Thus, 23 (35.3%) patients (14 males and 9 females) carried VRE (all with MIC >128 µg/ml) in their gastrointestinal tract. All the VRE isolates were susceptible to linezolid. Risk factors that

showed significant association with VRE colonization ($X^2$ test, $P<0.001$) were as follows: hospitalization within a month, age less than a year and longer length of hospital stay (≥6 days) compared to children with no VRE carriage. Majority of children (18 of 23) with VRE colonization were less than a year old with 83 per cent (15 out of 18) of these being neonates. Of those colonized, only two children developed sepsis due to VRE; risk of VRE bacteraemia being 8.7 per cent as compared to 2.3 per cent (1 among 45) in non-colonized cases. The reported risk of VRE bacteraemia among VRE colonized ranges from 0 to 16 per cent[11]. VRE colonization was higher for children with low birth weight or poor nutritional status, but the difference was not significant. Furthermore, no gender-based difference was found. Exposure to antibiotics, particularly meropenem, colistin and amikacin, was associated with VRE colonization; this was consistent with previous studies suggesting that antibiotic regimens with activity against anaerobic flora were potent risk factors in the development of VRE[12]. Fluoroquinolones, vancomycin and third-generation cephalosporins were also frequently used in all these patients. The high rates of antibiotic use and the small number of individuals in both groups make it difficult to draw conclusions regarding the role of antibiotic usage in VRE acquisition.

In our study, a high rate (35.3%) of VRE carriage was observed as compared to studies that have estimated comparatively low VRE colonization on admission to the ICU from Europe (2.7%), US (12.3%), South America (7%) and other Asian countries (5.3%)[11]. A limitation of this study was that we were not able to determine the timing of acquisition of VRE in the patients identified as being colonized; therefore, patients might have acquired VRE in the remote past, with antibiotic use merely amplifying existing colonization. According to Ziakas *et al*[11], the time to screening after ICU admission resulted in different VRE prevalence estimates, but these differences were not significant and thus screening after 48 h should not have affected our results.

In this study rectal swabs were chosen due to practical reasons, but previous studies have demonstrated that the sensitivity of these specimens was only around 79 per cent; so, we might have missed detection of a few patients with low VRE density[13]. VRE can survive in the environment for prolonged periods (>1 wk), this feature allows them to adapt well to any environment, and can contaminate almost any surface[14]. Transmission of VRE can occur through direct contact with colonized or infected patients or through indirect contact through the hands of healthcare workers, or through contaminated patient care equipment or environmental surfaces[15]. Another limitation of this study was the inability to screen hands of healthcare personnel attending these patients and to determine maternal carriage which could have contributed to establishment of source. Thus, strict adherence to handwashing cannot be overemphasized[3].

In conclusion, our study gives an insight into the high gastrointestinal carriage among the neonates and children hospitalized in ICU. More elaborative studies need to be done to better understand the epidemiology of VRE in the Indian context and to emphasize the need for a restriction on antibiotics use and drafting of guidelines along with a more resolute implementation of infection control policies in the country.

***Financial support & sponsorship*:** None.

***Conflicts of Interest*:** None.

**Prakhar Agarwal[†], Lipika Singhal[1,*], Varsha Gupta[1], Vishal Guglani[2] & Jagdish Chander[1]**

Departments of [1]Microbiology & [2]Paediatrics, [†]Government Medical College Hospital, Chandigarh 160 030, India

[*]*For correspondence*: singhal.lipika@gmail.com

Received December 30, 2016

## References

1. Soule D, Climo M. A clinician's guide to the treatment of vancomycin resistant enterococci bacteremia and endocarditis. *Curr Treat Options Infect Dis* 2016; *8* : 194-207.
2. Palmer KL, Kos VN, Gilmore MS. Horizontal gene transfer and the genomics of enterococcal antibiotic resistance. *Curr Opin Microbiol* 2010; *13* : 632-9.
3. Kauffman CA. Therapeutic and preventative options for the management of vancomycin-resistant enterococcal infections. *J Antimicrob Chemother* 2003; *51* (Suppl 3) : iii23-30.
4. Rice LB. Emergence of vancomycin-resistant enterococci. *Emerg Infect Dis* 2001; *7* : 183-7.
5. Moellering RC Jr. *Enterococcus* species, *Streptococcus bovis* and *Leuconostoc* species. In: Mandell GL, Bennet JE, Dolin R, editors. *Principles and practice of infectious diseases*, 4th ed. New York: Churchill Livingstone; 1995. p. 1826-35.
6. Weber SG, Huang SS, Oriola S, Huskins WC, Noskin GA, Harriman K, *et al.* Legislative mandates for use of active surveillance cultures to screen for methicillin-resistant

*Staphylococcus aureus* and vancomycin-resistant enterococci: Position statement from the joint SHEA and APIC task force. *Am J Infect Control* 2007; *35* : 73-85.

7. Song JY, Hwang IS, Eom JS, Cheong HJ, Bae WK, Park YH, *et al.* Prevalence and molecular epidemiology of vancomycin-resistant enterococci (VRE) strains isolated from animals and humans in Korea. *Korean J Intern Med* 2005; *20* : 55-62.
8. Winn WC, Allen SD, Janda WM, Koneman EW, Procop G, Schreckenberger P, *et al*. Identification of enterococcus species. *Koneman's color atlas and textbook of diagnostic microbiology*. 6th ed. Estados Unidos: Lippincott Williams & Wilkins; 2006.
9. Collee JG, Duguid JP, Fraser AG, Marmion BP, Simmons A. Laboratory strategy in the diagnosis of infective syndromes. In: Collee JG, Fraser AG, Marmion BP, Simmons A, editors. *Mackie & McCartney practical medical microbiology*, 14th ed. New York: Churchill Livingstone; 1996. p. 53-94.
10. Clinical and Laboratory Standards Institute. *Performance standards for antimicrobial susceptibility testing; 28th informational supplement.* CLSI Document M100-S25. Wayne, PA: CLSI; 2018.
11. Ziakas PD, Thapa R, Rice LB, Mylonakis E. Trends and significance of VRE colonization in the ICU: A meta-analysis of published studies. *PLoS One* 2013; *8* : e75658.
12. Donskey CJ, Chowdhry TK, Hecker MT, Hoyen CK, Hanrahan JA, Hujer AM, *et al.* Effect of antibiotic therapy on the density of vancomycin-resistant enterococci in the stool of colonized patients. *N Engl J Med* 2000; *343* : 1925-32.
13. D'Agata EM, Gautam S, Green WK, Tang YW. High rate of false-negative results of the rectal swab culture method in detection of gastrointestinal colonization with vancomycin-resistant enterococci. *Clin Infect Dis* 2002; *34* : 167-72.
14. Neely AN, Maley MP. Survival of enterococci and staphylococci on hospital fabrics and plastic. *J Clin Microbiol* 2000; *38* : 724-6.
15. Tacconelli E, Cataldo MA. Vancomycin-resistant enterococci (VRE): Transmission and control. *Int J Antimicrob Agents* 2008; *31* : 99-106.