Bacterial etiology and antibiotic resistance profile of bloodstream infections in human immunodeficiency virus patients from Southern India

Sir,

Human immunodeficiency virus (HIV) patients continue to be at high risk of acquiring bacterial bloodstream infections (BSIs) despite antiretroviral treatment.[1] Clinical utility of high-class antibiotics, especially the third-generation cephalosporins and carbapenems as treatment options, drives the emergence of multidrug-resistant (MDR) bacteria.[2] Studying bacterial etiology of BSI in HIV patients and understanding their resistance rate to antibiotics would help in the proper antibiotic selection for treatment regimens and avoid further emergence of antibiotic resistance. Reports on BSI and its antimicrobial resistance profile in HIV patients from southern India remain scarce. Hence, this study aimed to retrospectively analyze (2009–2017) the bacterial etiology of BSI in HIV patients attending YRG CARE, Chennai, using conventional culture techniques, and from 2017, BSI was identified using BD BACTEC™ FX 40 automated blood culture system (Becton, Dickinson and Company, USA). Antibiotic-resistant profile was determined using Kirby–Bauer disc diffusion method as per the CLSI guidelines.[3]

A total of 51 (5.24%) bacterial strains were isolated from blood specimens collected from 972 HIV patients. *Staphylococcus aureus* caused high level of BSI (47), followed by *Escherichia coli* (33.3%), *Klebsiella pneumoniae* (6%), *Salmonella* spp. (4%), *Pseudomonas aeruginosa* (2%), and *Enterococcus* spp. (2%). High positivity of BSI was observed in the year 2014 (n = 15; 29.4%) followed by 2016 (n = 10; 19.6%). Positivity of BSI was higher among male (74.5%; n = 38) than female (25.5%; n = 13) HIV patients. BSI was highly seen in patients within the age group of 31–45 years (mean age: 40.3 years). Hospitalized HIV patients showed higher rate of (n = 38; 74.5%) BSI. *S. aureus* strains from BSI were highly resistant to ofloxacin (75%), penicillin (71%), azithromycin (58.3%), erythromycin (54.2%), and methicillin/oxacillin (50%). *E. coli* exhibited high level of resistance to ampicillin (82.3%) followed by ceftazidime (82.3%), cefotaxime and ciprofloxacin (76.5%), and cefazolin, ceftriaxone, cefuroxime, levofloxacin, meropenem, and piperacillin (57.1%). A steep increase in resistance was observed among *E. coli* strains against amoxiclav (14.3%–57.1%), cefepime (14.3%–57.1%), and cefazolin, cefuroxime, and ceftriaxone (from 25% to 50%) from 2009 to 2017. *K. pneumoniae* isolates exhibited 100% resistance against ampicillin and ceftazidime, followed by 66.7% to cefotaxime, ciprofloxacin, and meropenem [Table 1].

Immune dysregulation among HIV patients results in increased risk of morbidity due to *S. aureus* causing BSI.[1] Gram-negative bacteria were reported to be responsible for one-fifth of all BSIs, among which *E. coli* and *P. aeruginosa* were reported more frequently.[4] Contrarily, here, Gram-positive bacteria (*S. aureus*; 47%) caused high level of BSI than Gram-negative bacteria (*E. coli*; 33.3%). From Malawi,[5] a 19-year surveillance study reported that *E. coli*, *S. aureus*, and *Klebsiella* spp. caused 8.8%, 6.6%, and 4.4% of BSI in non-HIV patients, respectively. In this current study, *E. coli* exhibited extended resistance profile to carbapenem antibiotics (39.6%), especially against imipenem (50%), which is contrasting to the other study where *E. coli* isolated from HIV patients had shown 100% sensitivity to imipenem.[6] Increased level of antibiotic resistance makes difficult the treatment of BSI caused by carbapenem-resistant Enterobacteriaceae and also by aminoglycoside and fluoroquinolone resistant bacteria. This study concludes that methicillin-resistant *S. aureus* (MRSA) and the third-generation cephalosporin- and carbapenem-resistant *Enterobacteriaceae* were the main etiological agents responsible for BSI in HIV patients. Incidence of MRSA and MDR *Enterobacteriaceae* increases the severity of BSI due to its resistance profile, making clinical management and antibiotic selection highly challenging in our resource-limited HIV care setting.

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Conflicts of interest

There are no conflicts of interest.

Table 1: Year-wise antibiotic resistance profile of *Staphylococcus aureus* and *Escherichia coli* isolated from bloodstream infections in human immunodeficiency virus patients

Class of antibiotics	Antibiotics	Study periods								
		2009	2010	2011	2012	2013	2014	2015	2016	2017
Staphylococcus aureus										
Fluoroquinolones	Ciprofloxacin	0	0	0	0	9.1	18.2	9.1	45.5	9.1
	Levofloxacin	0	0	0	0	0	0	16.7	66.7	16.7
	Ofloxacin	11.1	5.5	0	0	5.5	22.2	16.6	27.	5.5
Lincosamides	Clindamycin	0	0	0	0	16.7	33.3	16.7	16.7	16.7
Tetracyclines	Doxycycline	0	0	0	0	33.3	0	0	33.3	0
Macrolides	Azithromycin	0	0	0	0	7.1	21.4	28.6	28.6	7.1
	Erythromycin	0	0	0	0	7.7	31	23.1	23.1	7.7
Aminoglycosides	Gentamicin	0	11.1	0	0	11.1	33.3	11.1	22.2	0
Antistaphylococcal β-lactams	Oxacillin	25	8.3	0	0	0	8.3	16.6	25	8.3
Penicillin	Penicillin	0	0	0	0	5.9	29.4	29.4	23.5	5.9
Ansamycins	Rifampicin	33.3	0	0	0	0	11.1	11.1	33.3	11.1
Escherichia coli										
Aminoglycosides	Amikacin	0	0	0	0	0	50	50	0	0
	Gentamicin	0	0	0	11.1	0	44.4	11.1	11.1	22.2
Penicillins + β-lactamase inhibitor	Amoxyclav	0	0	0	-	0	-	14.3	28.8	57.1
Penicillins	Ampicillin	0	0	0	7.1	0	35.7	14.3	14.3	28.6
Nonextended spectrum cephalosporins; 1st and 2nd generation cephalosporins	Cefazolin	0	0	0	-	0	-	25	25	50
	Cefuroxime	0	0	0	-	0	-	25	25	50
Extended-spectrum cephalosporins; 3rd and 4th generation cephalosporins	Cefepime	0	0	0	-	0	-	14.3	28.8	57.1
	Ceftazidime	0	0	0	7.1	0	35.7	14.3	14.3	28.6
	Cephotoxime	0	0	0	7.7	0	38.5	15.4	15.4	23.1
	Ceftriaxone	0	0	0	-	0	-	25	25	50
Cephamycins	Cefoxitin	0	0	0	-	0	-	40	40	20
Fluoroquinolones	Ciprofloxacin	0	0	0	7.7	0	31	15.4	15.4	31
	Levofloxacin	0	0	0	0	0	-	25	25	50
Folate pathway inhibitors	Co-trimoxazole	0	0	0	14.3	0	-	28.8	14.3	42.8
Carbapenems	Imipenem	0	0	0	0	0	0	50	0	50
	Meropenem	0	0	0	0	0	12.5	25	25	37.5
Antipseudomonal penicillins + β-lactamase inhibitors	Piperacillin	0	0	0	-	0	-	25	25	50
	Piperacillin-tazobactam	0	0	0	-	0	-	66.6	0	33.3
Tetracyclines	Tetracycline	0	0	0	-	0	-	33.3	33.3	33.3

Chinnambedu Ravichandran Swathirajan[1], Marimuthu Ragavan Rameshkumar[1], Sunil Suhas Solomon[1,2], Amrose Pradeep[3], Devaraj Ajay Chithra[3], Ramasamy Balakrishnan[3], Ramachandran Vignesh[1,4], Pachamuthu Balakrishnan[1]

[1]Infectious Diseases Laboratory, Y. R. Gaitonde Centre for AIDS Research and Education, Voluntary Health Services Hospital Campus, Chennai, Tamil Nadu, India, [2]Department of Medicine, Johns Hopkins University School of Medicine, Baltimore, MD, USA, [3]HIV Clinic, Y. R. Gaitonde Centre for AIDS Research and Education, Voluntary Health Services Hospital Campus, Chennai, Tamil Nadu, India, [4]Department of Preclinical, Faculty of Medicine, University Kuala Lumpur Royal College of Medicine Perak, Ipoh, Malaysia

Address for correspondence: Dr. Pachamuthu Balakrishnan, Infectious Diseases Laboratory, Y. R. Gaitonde Centre for AIDS Research and Education, Voluntary Health Service Hospital, Chennai, Tamil Nadu, India.
E-mail: bala@yrgcare.org

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