Retrospective Analysis of Antibiotic Resistance in *Streptococcus* spp. from HIV Patients (2012–2017) from Southern India

Sir,

Human immunodeficiency virus (HIV)-infected patients have the risk of increasing the incidence of invasive disease causing by *Streptococcus* spp.[1] Bacterial pneumonia can occur throughout HIV infection from early to advanced immunosuppression. Centers for Disease Control and Prevention (CDC) categorized drug-resistant *S. pneumoniae* as seriously hazardous bacteria, and erythromycin-resistant *Streptococcus* Group A and clindamycin-resistant *Streptococcus* Group B under the hazardous level category, which is concerning.[2] In the present study, a retrospective analysis on the drug-resistance profile of streptococcal infections was investigated among the HIV patients who attending Y. R. Gaitonde Center for AIDS Research and Education (YRG CARE), Chennai, India from the year 2012 to 2017.

Antibiotic susceptibility testing of *Streptococcus pyogenes* and α-hemolytic *Streptococcus* spp. was performed by Kirby–Bauer disc diffusion method[3] using antibiotics such as ampicillin (10 μg), cefepime (30 μg), ceftriaxone (30 μg), cefotaxime (30 μg), chloramphenicol (30 μg), clindamycin (2 μg), erythromycin (15 μg), levofloxacin (5 μg), ofloxacin (5 μg), penicillin (10 units), and vancomycin (30 μg), and the results were analyzed. The limitation of this study was that the antibiotics suggested by the Clinical and Laboratory Standards Institute (CLSI) such as linezolid, quinupristin-dalfopristin, tedizolid, and daptomycin were not used since those antibiotics were not affordable in our resource-limited settings. A total of 7200 clinical specimens collected from the HIV patients were processed, and 1.3% (n = 94) were found to be infected by *S. pyogenes* with male HIV population being the most infected by both *S. pyogenes* (77.6%; n = 73) and α-hemolytic *Streptococcus* spp. (76.3%; n = 58). Higher infection rates were seen in HIV patients within the age group of 31–45. *S. pyogenes* (88.5%; n = 85) was most frequently isolated from the sputum specimens with the incidence rate being higher in 2012 (25.5%). In this study, the multidrug-resistance profile was noted against 87% of *Streptococcus* spp. isolated from the HIV population. It was noted that *S. pyogenes* showed high level of resistance to cefepime (91.2%) followed by the levofloxacin (61.4%), penicillin (57.4%), and ampicillin (54.3%) and showed higher sensitivity toward chloramphenicol (91.5%). It should be important to note that there was an ascending trend in the antibacterial resistance level of *Streptococcus* spp. against co-trimoxazole, penicillin, cefepime, ceftriaxone, cephotoxime, and clindamycin over the study years [Table 1]. In this study, α-hemolytic *Streptococcus* spp. accounted for 1% (n = 76) of the specimens studied, mostly isolated from sputum (97.4%; n = 74) with the highest number of infections (31.6%) in 2016. The α-hemolytic *Streptococcus* spp. also showed high-level resistance to co-trimoxazole (94.7%) and similar to *S. pyogenes,* α-hemolytic *Streptococcus* spp. also showed high sensitivity to chloramphenicol (94.7%).

The prevalence of invasive and noninvasive streptococcal infections has gradually increased in India and other Asian countries.[4] In a study from Romania in 2013, Stoian *et al.*[5] reported that Gram-positive infections are more common in HIV patients. *S. pyogenes* was observed more frequently among the total *Streptococcus* spp. isolated from the HIV patients. It was found that α-hemolytic *Streptococcus* spp. was showing high resistance to co-trimoxazole similar to

Table 1: Year-wise resistance profile of *Streptococcus pyogenes-isolated* from human immunodeficiency virus patients from 2012 to 2017

Parameters studied	Percentage of resistance in study period						Total (n=94) (%)
	2012 (n=24) (%)	2013 (n=13) (%)	2014 (n=15) (%)	2015 (n=15) (%)	2016 (n=15) (%)	2017 (n=12) (%)	
AMP	41.7	53.8	53.3	46.7	86.7	50	54.3
CPM	NS	NS	80	100	93.3	91.7	91.2
CTR	37.5	30.7	6.7	40	33.3	50	33
CTX	NS	NS	20	33.3	40	58.3	37
C	0	7.7	0	6.7	6.7	8.3	4.2
CLN	NS	NS	53.3	53.3	26.7	8.3	37
ERY	16.7	38.5	20	33.3	33.3	0	23.4
LEV	NS	NS	53.3	60	60	75	61.4
OFX	8.3	15.4	60	66.7	73.3	25	39.3
PEN	50	84.6	53.3	60	60	41.7	57.4
VAN	8.3	20.1	46.7	33.3	13.3	0	20.2

AMP: Ampicillin, CPM: Cefepime, CTR: Ceftriaxone, CTX: Cefotaxime, C: Chloramphenicol, CLN: Clindamycin, ERY: Erythromycin, LEV: Levofloxacin, OFX: Ofloxacin, PEN: Penicillin, VAN: Vancomycin, NS: Not significant

the study by Stoian *et al.* 2013.[5] In this study, infection by *Streptococcus* spp. has been observed frequently as a cause of bacterial pneumonia. A retrospective study (2002 and 2010) performed in France reported that the infants born to HIV-infected women who have low CD4 cell count.[6] A 4-year study[7] from India reported that high level (28%) of resistance to erythromycin was observed in β-hemolytic Streptococci. In this study, erythromycin resistance was highly noted in 2013 as 38.5%, and overall the study period, it was noted as 23.4%. It was also noted that the β-hemolytic Streptococci showed the high level of drug resistance against antibiotics belongs to β-lactams, especially penicillins, cephalosporins, and fluoroquinolones. The trend of antimicrobial resistance of *Streptococcus* spp. gains the importance as a potential etiological agent, especially in an HIV setting. Higher resistance in HIV-infected population by both *S. pyogenes* and α-hemolytic *Streptococcus* spp. observed in this study might be a cause of continuous exposure and overuse of antibiotics. World Health Organization (WHO) reported penicillin-resistant *S. pneumoniae* as an important resistant combination, and this bacterial resistance causing a significant public health problem worldwide and reported it as the important bacterial etiology of the hospital and/or community-acquired infections. New antibacterial drugs are needed for the management of infections caused by the drug-resistant bacterium and also to control the further development of antibacterial resistance.[8] With not many reports observed the prevalence of *Streptococcus* spp.-related bacterial pneumonia in HIV patients in India, this retrospective analysis gains the importance as a proof of its co-infecting capabilities and antimicrobial resistance development. This report indicates year-wise monitoring studies should be carried out that could alert the medical practitioners on emerging drug-resistance patterns of streptococcal infections.

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Conflicts of interest

There are no conflicts of interest.

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References

1. Gill CJ, Mwanakasale V, Fox MP, Chilengi R, Tembo M, Nsofwa M, *et al.* Impact of human immunodeficiency virus infection on *Streptococcus pneumoniae* colonization and seroepidemiology among Zambian women. J Infect Dis 2008;197:1000-5.
2. Centres for Disease Control and Prevention. Antibiotic Resistance Threats in the United States, 2013. Atlanta: Centres for Disease Control and Prevention (CDC); 2013.
3. Patel JB, Cockerill FR, Alder J, Bradford PA, Eliopoulos GM, Hardy D, *et al*. Performance standards for antimicrobial susceptibility testing; twenty-fourth informational supplement. CLSI standards for antimicrobial susceptibility testing. Clin Lab Stand Inst 2014;34:1-226.
4. Mathur P, Kapil A, Das B, Dhawan B, Dwivedi SN. Invasive beta-haemolytic streptococcal infections in a tertiary care hospital in Northern India. J Med Microbiol 2002;51:791-2.
5. Stoian AC, Dumitrescu F, Niculescu I, Iocu C, Marinescu L, Stănescu M, *et al*. Gram positive bacterial infections in immunocompromised patients with HIV infection. BMC Infect Dis 2013;13:30.
6. Dauby N, Chamekh M, Melin P, Slogrove AL, Goetghebuer T. Increased risk of group B *Streptococcus* invasive infection in HIV-exposed but uninfected infants: A review of the evidence and possible mechanisms. Front Immunol 2016;7:505.
7. Bhardwaj N, Mathur P, Behera B, Mathur K, Kapil A, Misra MC. Antimicrobial resistance in beta-haemolytic streptococci in India: A four-year study. Indian J Med Res 2018;147:81-7.
8. World Health Organization. Antimicrobial Resistance: Global Report on Surveillance. Geneva, Switzerland: WHO; 2014.

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