

Commentary

Citrobacter: An emerging health care associated urinary pathogen

Hospital-acquired urinary tract infection (UTI) is the commonest health care associated infection (nosocomial infection) accounting for 35-40% of the total health care infections, thus posing a serious health threat.^[1] Also, the

prevalence of antimicrobial resistance among urinary pathogens has increased worldwide due to uncontrolled and indiscriminate antibiotic usage.^[2] Adding to it, certain pathogens which were isolated sporadically have now emerged as prominent health care associated pathogens.

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The author reports the emergence of *Citrobacter* as a common urinary pathogen in hospitalized patients. The genus *Citrobacter* was discovered in 1932 by Werkman and Gillen. These organisms are found in soil, water, intestinal tract of animals, and in human clinical samples. Members of the genus *Citrobacter* are gram-negative, non-sporing rods belonging

to family Enterobacteriaceae and, as the name suggests, usually utilize citrate as a sole carbon source. The genus now consists of 11 genomospecies separable by their biochemical characteristics. Out of them, *C. koseri* has been associated with cases of neonatal meningitis and brain abscess and *C. freundii* with gastroenteritis, neonatal meningitis, and septicemia.^[3] It is known to cause health care associated infections of the urinary tract, respiratory tract, blood, and other normally sterile sites in the body. The chief cause is a weak and attenuated immune system and functioning of the body. A frail immune system makes the body more vulnerable and predisposed to *C. freundii*, thus triggering UTI or intestinal infection or meningitis. Hospitalized patients, especially those who have been hospitalized for a prolonged period of time, are more vulnerable to *C. freundii* infections.

The authors have conducted a retrospective study and have reported *Citrobacter* spp. as the third most common urinary pathogen accounting for 9.4% of the total isolates. The isolation of this organism was associated with catheterization, genitourinary instrumentation, or obstructive uropathy. Also, the age group most affected was that of elderly hospitalized patients, especially males. Their finding emphasizes the role of this organism as a common health care associated pathogen. Recently, a study conducted in Nepal also reported *Citrobacter* spp. as the second most common urinary pathogen in their study.^[4]

Although *Citrobacter* spp. are less commonly isolated, they are emerging as a common nosocomial multidrug-resistant pathogen, especially in developing countries. UTI caused by *Citrobacter* spp. have been seen in 12% patients in 1961, and since then, its prevalence has been increasing.^[5] Invasive procedures like catheterization or genitourinary instrumentation seem to assist the organism in colonization and infection of urinary tract. Another matter of concern is the emergence of multidrug-resistant *Citrobacter* spp., resulting in reduced therapeutic options which further complicate the situation. The author also reported that most of the isolates were resistant to penicillins, cephalosporins, aminoglycosides, and fluoroquinolones, which are the commonly prescribed drugs in UTI. Resistance to many groups of antibiotics has been observed and many mechanisms of drug resistance have been demonstrated in *Citrobacter* spp. In a study concluded by Shobha *et al.*, *Citrobacter* spp. was the third most common urinary pathogen and 30% of the isolates were extended spectrum beta lactamase (ESBL) producers.^[6] Meher Rizvi *et al.* reported that 62.2% of *Citrobacter* isolates were producing ESBL.^[7] High level carbapenem resistance was also reported in *C. freundii* due to combination of *Klebsiella pneumoniae*

carbapenemase-2 (KPC-2) production and decreased porin expression.^[8] Carbapenems are important antibiotics for the treatment of health care associated infections and have a special role in treating infection with ESBL-producing organisms. The emergence and spread of resistance to carbapenems will end all the treatment options available for treating multidrug-resistant pathogens.

In conclusion, the emergence of this usually rare organism as a common nosocomial urinary pathogen is alarming. As the drug options are limited in the current scenario, injudicious and inadequate use of antibiotics should be avoided, at least till scientists worldwide find some new revolutionary drug which can counter all these drug resistance mechanisms. Till then, studies like this should be carried out in different institutes as the prevalence and antibiotic susceptibility patterns vary enormously even in different institutes of the same geographic area. Infection control practices should be observed strictly and any type of unnecessary instrumentation should be avoided.

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