Infection Control Care
Bundles Prevents Emergence
of Multidrug Resistant
Nosocomial Pathogens
in Newborn Care Units:
A Perspective

Sir,

We report an outbreak of multidrug resistant (MDR) Klebsiella pneumoniae in our neonatal intensive care unit (NICU) and the preventive measures adopted to control it.

The outbreak began with a 28-week, appropriate for gestational age baby who developed clinical features of sepsis at 48 h of life. Piperacillin-tazobactam and amikacin were started empirically, and later changed to meropenem, as Klebsiella pneumoniae was isolated in blood culture, sensitive only to meropenem. Second baby, a 33-week, small for gestational age (SGA) baby, admitted 3 days later developed MDR Klebsiella sepsis at 48 h of life. Third and fourth babies were 30-week, SGA twins admitted 10 days prior to the outbreak. Heavy growth of Klebsiella pneumoniae sensitive to piperacillin-tazobactam was isolated from the umbilical catheter tip of first twin on day 5 of life. The second twin had features suggestive of early onset sepsis and blood culture grew Klebsiella pneumoniae sensitive to piperacillin-tazobactam. Though both babies were showing signs of improvement on piperacillin-tazobactam, they had clinical deterioration 48 h after the detection of MDR Klebsiella in the index baby. Hence, meropenem was started after sending repeat blood culture in which MDR Klebsiella was isolated. The characteristics of the isolates are depicted in Table 1. Two out of these four babies did not survive. Following this outbreak, active surveillance was initiated. Swabs were taken from all surfaces, equipments, and water source followed by 24-h fumigation with formaldehyde. Swabs taken from the power and timer button of the warmer of the index patient showed growth of MDR Klebsiella. Subsequent strategy adopted was a set of interventions which included short fumigations at 3 months interval, reinforcing strict hand washing before and after patient care, disinfecting hands after handling equipments, contact isolation and strict barrier nursing for any baby with suspected or proven sepsis, maintaining closed vascular system for administering parental fluids, reinforcing strict aseptic and judicious catheter insertion practices, daily environmental cleaning with 1:100 sodium hypochlorite solution, policy restriction on empirical use of third generation cephalosporin, and periodic surveillance. In the subsequent 7 months there were no reports of MDR Klebsiella, and also the incidence of culture positive sepsis among the neonates decreased from 8% during the pre-intervention period to 4% during the post-intervention 7 months period (P = 0.027).

Emergence of mutated extended-spectrum β-lactamase (ESBL) producers associated with indiscriminate use of beta-lactam antibiotics containing oxyimino group are being increasingly reported. These ESBL producers colonize the hands of healthcare personnel and lead to spread of infection. Carbapenems were the main class of drugs used in combating ESBL producers. But organisms resistant to carbapenems have emerged, notably Klebsiella pneumoniae carbapenemase (KPC). In our case series, AmpC-type beta-lactamase was detected in all isolates; the striking absence of ESBL on phenotypic confirmation could be due to the presence of AmpC-type beta-lactamase, which resist inhibition by clavulanate. Polymerase chain reaction (PCR) and deoxyribonucleic acid (DNA) sequencing were unavailable to confirm the presence of ESBL/KPC activity. This article emphasizes importance of a “bundle” approach of preventive interventions in containing outbreaks with MDR organisms.

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Conflicts of interest

There are no conflicts of interest.

Table 1: Characterization of Klebsiella pneumoniae isolated during the outbreak

| Patient | AmpC | ESBL | KPC/MBL | AMP | GEN | COT | CIP | CTR | CTX | AK | IMP | TZP | PMB | CL |
|---------|------|------|---------|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|
| Patient 1 | +    | —    | —       | R   | R   | R   | S   | I   | R   | R   | R   | S   | R   | S   | S   |
| Patient 2 | +    | —    | —       | R   | R   | R   | R   | R   | R   | R   | S   | R   | S   | S   |
| Patient 3 | +    | —    | —       | R   | R   | R   | I   | R   | R   | R   | S   | R   | S   | S   |
| Patient 4 | +    | —    | —       | R   | R   | R   | I   | R   | R   | R   | S   | R   | S   | S   |

R: Resistant, S: Sensitive, I: Intermediate, ESBL: Extended-spectrum β-lactamase, KPC: Klebsiella pneumoniae carbapenemase, AMP: Ampicillin, GEN: Gentamycin, COT: Cotrimoxazole, CIP: Ciprofloxacin, CTR: Ceftriaxone, CTX: Cefotaxime, AK: Amikacin, IMP: Imipenem, TZP: Piperacillin tazobactam, PMB: Polymixin B, CL: Colistin, MBL: Metallo-beta-lactamase. Antibiotic susceptibility was tested by Kirby Bauer Disk Diffusion method. AmpC was detected by AmpC disk test, KPC by Modified Hodge Test, ESBL phenotype confirmation by Cephalosporin/Clavulanate Combination Disk Method, and MBL by Imipenem-EDTA Double-Disk Synergy Test.
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