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Clinical characteristics and epidemiology of sepsis in the neonatal intensive care unit in the era of multi-drug resistant organisms: A retrospective review

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Background: Sepsis in the neonatal intensive care unit (NICU) remains one of the most significant causes of morbidity and mortality, especially for preterm newborns. Multi-drug resistant organisms (MDRO) are emerging as important pathogens causing neonatal sepsis in the NICU. Therefore, it is important to study the epidemiology, clinical features and outcome of MDRO sepsis compared to other organisms, and to identify risk factors that may predispose to sepsis caused by MDRO.

Methods: Episodes of blood culture-proven sepsis for patients (0-90 days) in the NICU at our institution from January 2012 through December 2015 were retrospectively reviewed. Collected data included the demographics, signs at time of sepsis, laboratory values, microbiologic results and final outcome. We compared clinical and laboratory data and final outcome for patients with sepsis due to MDRO vs. non-MDRO.

Results: 68 episodes of sepsis (ages 0-54 d, median 7 d; 34 female; 81% premature) were caused by gram-negative bacteria (n=42; 62%), gram-positive bacteria (n=21; 31%), or candida species (n=5; 7%). The most common organisms isolated were *Acinetobacter baumannii* (27%), *Klebsiella pneumoniae* (22%), coagulase-negative staphylococcus (CoNS) (18%), group B streptococcus (10%) and *E. coli* (6%). Compared to non-MDRO cases (n=15; 29%, excluding CoNS and candida), MDRO (n=36; 71%) were associated with higher mortality (58% vs. 13%, p=0.005) and more delay in providing targeted antimicrobial therapy (61% vs. 13%, p=0.004). Sepsis due to the most resistant organisms [*A. baumannii* and *K. pneumoniae* Carbapenemase (KPC)-producing bacteria, n=20; 39%] was associated with higher mortality, higher rates of leukopenia and thrombocytopenia (p=0.001, 0.02, 0.04; respectively), and significantly associated with exposure to a carbapenem and vancomycin before onset of sepsis [cases exposed=16/20; 80%, p<0.001, median days of exposure=10 (3-17)].

Conclusion: MDRO are the most common causative pathogens of sepsis at our NICU, and are associated with higher mortality compared to non-MDRO. Previous exposure to a carbapenem and vancomycin was associated with sepsis caused by the most resistant organisms, which had higher mortality and higher rates of leukopenia and thrombocytopenia.

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