Nosocomial infection

see Nosocomial pneumonia.

see also Nosocomial meningitis.

Hospital-acquired infection (HAI) — also known as nosocomial infection — is an infection whose development is favored by a hospital environment, such as one acquired by a patient during a hospital visit or one developing among hospital staff.

In a single-center, retrospective analysis of critically ill pediatric trauma patients, nosocomial infections were more frequently observed in patients admitted following polytrauma with traumatic brain injury than in patients with isolated traumatic brain injury or trauma without traumatic brain injury [1].

In the last few decades, there has been a tremendous advancement in foetal and maternal care, and it has led to premature babies born as early as 25 weeks of gestation being nursed and cared for in neonatal and pediatric intensive care units. However, these children can pick up a number of uncommon and rare hospital-acquired infections including central nervous system infections.

Wagh and Sinha have given their own insight as to the prevention of healthcare-associated infections in paediatric intensive care settings and reviewed the current literature on the topic.

Healthcare-associated infections are largely preventable provided adequate prevention and protective measures are put in place and prevention guidelines are stritctly followed [2].

In the United States, the Centers for Disease Control and Prevention estimated roughly 1.7 million hospital-associated infections, from all types of microorganisms, including bacteria, combined, cause or contribute to 99,000 deaths each year.

In Europe, where hospital surveys have been conducted, the category of gram-negative infections are estimated to account for two-thirds of the 25,000 deaths each year. Nosocomial infections can cause severe pneumonia and infections of the urinary tract, bloodstream and other parts of the body. Many types are difficult to attack with antibiotics, and antibiotic resistance is spreading to gram-negative bacteria that can infect people outside the hospital.

Hospital-acquired infections are an important category of hospital-acquired conditions. HAI is sometimes expanded as healthcare associated infection to emphasize that infections can be correlated with health care in various settings (not just hospitals), which is also true of hospital-acquired conditions generally.

Data on nosocomial bloodstream infections (NBSI) in neurosurgery is limited. A study aimed to analyze the epidemiology, microbiology, outcome, and risk factors for death in neurosurgical patients with NBSI in a multidrug resistant setting.

Neurosurgical patients with a confirmed NBSI within the period 2003-2012 were retrospectively analyzed. NBSI was diagnosed when a pathogen was isolated from a blood sample obtained after the first 48 h of hospitalization. Patients' demographic, clinical, and microbiological data were recorded and analyzed using univariate and multivariate analysis.

A total of 236 patients with nosocomial infection (NI) were identified and 378 isolates were recovered from blood cultures. Incidence of NI was 4.3 infections/1000 bed-days. Gram negative bacteria slightly predominated (54.5 %). The commonest bacteria were coagulase-negative Staphylococcus (CoNS, 26 %), Klebsiella pneumoniae (15.3 %), Pseudomonas aeruginosa (14.8 %), and Acinetobacter baumannii(13.2 %). Carbapenem resistance was found in 90 % of A. baumannii, in 66 % of P. aeruginosa, and in 22 % (2003-2007) to 77 % (2008-2012) of K. pneumoniae isolates ($p < 0.05$). Most CoNS and Staphylococcus aureus isolates (94 and 80 %, respectively) were methicillin-resistant. All Gram-negative isolates were sensitive to colistin and all Gram-positive isolates were sensitive to vancomycin and linezolid. Antimicrobial consumption decreased after 2007 ($p < 0.05$). Overall mortality was 50.4 %. In multivariate analysis, advanced age and stay in an Intermediate Care Unit (IMCU) were independent risk factors for in-hospital mortality ($p < 0.05$).

Overall, high incidence of NBSI and considerable resistance of Gram positive and particularly Gram negative bacteria were noted in neurosurgical patients. Mortality was high with advanced age and stay in IMCU being the most important death-related factor [3].

Case series

In one hundred fifty-three patients with aSAH. Delayed cerebral ischemia (DCI) was identified in 32 patients (20.9%). Nosocomial infection (odds ratio [OR] 3.5, 95% confidence interval [CI] 1.09-11.2, $p = 0.04$), ventriculitis (OR 25.3, 95% CI 1.39-458.7, $p = 0.03$), aneurysm re-rupture (OR 7.55, 95% CI 1.02-55.7, $p = 0.05$), and clinical vasospasm (OR 43.4, 95% CI 13.1-143.4, $p < 0.01$) were independently associated with the development of DCI. Diagnosis of nosocomial infection preceded the diagnosis of DCI in 15 (71.4%) of 21 patients. Patients diagnosed with nosocomial infection experienced significantly worse outcomes as measured by the modified Rankin Scale score at discharge and 1 year ($p < 0.01$ and $p = 0.03$, respectively).

Nosocomial infection is independently associated with DCI. This association is hypothesized to be partly causative through the exacerbation of systemic inflammation leading to thrombosis and subsequent ischemia [4].

References

1)

Sribnick EA, Hensley J, Moore-Clingenpeel M, Muszynski JA, Thakkar RK, Hall MW. Nosocomial Infection Following Severe Traumatic Injury in Children. Pediatr Crit Care Med. 2020 Feb 25. doi: 10.1097/PCC.0000000000002238. [Epub ahead of print] PubMed PMID: 32106190.

2)
Wagh A, Sinha A. Prevention of healthcare associated infections in pediatric intensive care unit. Childs Nerv Syst. 2018 Aug 18. doi: 10.1007/s00381-018-3909-4. [Epub ahead of print] PubMed PMID: 30121831.
3)
Tsitsopoulos PP, Iosifidis E, Antachopoulos C, Anestis DM, Karantani E, Karyoti A, Papaevangelou G, Kyriazidis E, Roilides E, Tsonidis C. Nosocomial bloodstream infections in neurosurgery: a 10-year analysis in a center with high antimicrobial drug-resistance prevalence. Acta Neurochir (Wien). 2016 Sep;158(9):1647-54. doi: 10.1007/s00701-016-2890-5. Epub 2016 Jul 25. PubMed PMID: 27452903.
4)
Foreman PM, Chua M, Harrigan MR, Fisher WS 3rd, Vyas NA, Lipsky RH, Walters BC, Tubbs RS, Shoja MM, Griessenauer CJ. Association of nosocomial infections with delayed cerebral ischemia in aneurysmal subarachnoid hemorrhage. J Neurosurg. 2016 Dec;125(6):1383-1389. PubMed PMID: 26871202.