Flavobacterium sepsis outbreak due to contaminated distilled water in a neonatal intensive care unit

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Summary

Outbreaks of sepsis due to water or contaminated equipment can cause significant mortality and morbidity in neonatal intensive care units. We studied an outbreak among neonates caused by flavobacterium and investigated the characteristics of the infected neonates, antimicrobial susceptibilities, and the source of the outbreak. Forty-five neonates with documented flavobacterium sepsis were evaluated in this descriptive study. Data including sex, vaginal delivery or caesarean, preterm or term, birth weight, results of blood cultures and antibiograms were recorded and cases followed up until death or recovery. Environmental sampling for detecting the source of contamination was performed. Among the 45 patients, 28 (62.2%) were male and 17 (37.8%) female ($P < 0.001$). The commonest clinical manifestation was respiratory distress (60%). Eighteen neonates (40%) were low birth weight. Thirty-seven neonates (82.2%) were born via caesarean section. Twenty (44.4%) were premature whereas 25 (55.6%) were term ($P < 0.001$). Mortality was 17.7%. All strains were resistant to ampicillin, and susceptible to amikacin. The source of outbreak was contaminated distilled water.

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Introduction

Sepsis is a serious problem in neonatal intensive care units (NICUs), and results in significant morbidity and mortality, especially during outbreaks. Neonates can present either shortly after birth or later with subtle signs to suggest infection. Despite significant improvements in management, sepsis remains one of the top causes of neonatal death. Outbreaks may be due to uncommon organisms such as bacillus, flavobacterium, or enterobacter and can result from contamination of equipment or water. Antimicrobial susceptibility patterns differ in various countries according to usage.

Continuous surveillance is necessary in all ICUs. During 2006–2008, we encountered an outbreak caused by flavobacterium in a NICU in Shabihkhani Hospital, Kashan, Iran. We studied its source and the characteristics of infected neonates.

Methods

Forty-five neonates had documented flavobacterium sepsis during the study period. All had clinical manifestations of sepsis and positive blood cultures (two sets) within four days of birth. Data collected included sex, vaginal delivery or caesarean, preterm and term, birth weight, results of blood cultures and antibiograms; cases were followed up until recovery or death. Data were analysed by SPSS software version 13.

Results

There were 28 (62.2%) male and 17 (37.8%) female neonates. The commonest clinical manifestation was respiratory distress, which was observed in 27 (60%). Clinical signs and symptoms are shown in Table I. Eighteen neonates (40%) had a low birth weight. Twenty (44.4%) were premature and 25 (55.6%) were term ($P < 0.001$). Thirty-seven (82.2%) were born via caesarean section and eight (17.8%) via vaginal delivery. Mean weight was $2647 \pm 871$ g (900–4100). Thirty-seven neonates (82.3%) recovered and eight (17.7%) died.
All strains were resistant to ampicillin, and susceptible to amikacin; six (13.3%) were resistant to gentamicin, one (2.2%) to ceftriaxone and eight (17.7%) to ceftazidime.

Flavobacterium was isolated from most of the distilled water throughout the hospital. The stills used for distilling waters were contaminated with flavobacterium. They had been previously used for distilling scented vegetables.

The outbreak was controlled by removing all the distilled water from the hospital and ensuring that the manufacturer controlled its equipment and sterilisation process.

**Discussion**

Most studies show that sepsis in male neonates is more frequent than in females; our study involved more males than females (62.2% vs 37.8%, P < 0.001). Prematurity has also been associated with sepsis; for example in a study in another part of Kashan, 73% of neonates with sepsis were premature. In our study only 44.4% (20 neonates) were premature.

Trotman et al. found an association between low birth weight and neonatal sepsis; 40% of our cases weighed <2500 g. The commonest presentation in our neonates was respiratory distress (60%) and poor feeding and lethargy were also common. Weber et al. found that the commonest presentation of neonatal sepsis was poor feeding (25.6%) followed by jaundice (16.2%), and lethargy (10.1%).

Since flavobacterium is a nosocomial infection, we evaluated possible reservoirs and found that distilled water was the source of contamination. Hoque et al. also found that tap water was the source of infection in eight neonates infected with flavobacterium.

All our flavobacterium strains were resistant to ampicillin, and all susceptible to amikacin. Conversely, in a study in Taiwan in 1996–1999 all isolated flavobacterium were resistant to amino-glycosides and in a Malaysian study strains were resistant to amikacin, amikacin and gentamicin. The pattern of antimicrobial susceptibility seems to differ in various communities.

In conclusion, we recommend continuous surveillance for finding and controlling outbreaks in NICUs. When an uncommon organism such as flavobacterium is found, evaluation of possible reservoirs such as equipment and water is necessary.

**Conflict of interest statement**

None declared.

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None.

**References**

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