



Early-onset neonatal sepsis and meningitis

Neonates less than seven days of age

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Background

The term “neonatal sepsis” is used to describe bacterial infections in newborn infants, which are primarily caused by group B Streptococcus (GBS or *Streptococcus agalactiae*).¹ In addition, neonatal sepsis is caused by Gram-negative organisms² (*Escherichia coli* or *E coli*), other Streptococci, various anaerobes, coagulase-negative or positive Staphylococcus and other enteric gram negatives.³ Confirmation of neonatal sepsis is generally accepted as positive blood cultures and/or lumbar puncture (LP). Early-onset neonatal sepsis (the first seven days of life) is caused primarily by GBS and *E coli*. The overall incidence of neonatal sepsis (less than one month) is approximately 4.63 per 1,000 live births,⁴ while the incidence of early-onset neonatal sepsis (less than seven days) has been assessed at 1–2 per 1,000 live births.⁵ The vast majority of these cases are acquired via maternal transmission; nosocomial infection is possible but thought to be rare.²

Throughout the twentieth century, there were two major shifts in the prevalence of pathogens that caused early-onset neonatal sepsis. In the early part of the century, group A Streptococci and *E coli* were the most frequent bacterial strains affecting newborn infants.⁴ This trend continued until the 1970s when an increased prevalence in GBS was observed.⁴ Recently, population-based surveillance performed at Shands Hospital at the University of Florida revealed that coagulase-negative Staphylococci, the third most common bacteria in previous years, was isolated at a rate of 1.46 per 1,000 live births, exceeding *E coli* that appeared in 0.90 per 1,000 live births.⁶ In addition, there have been reports suggesting increased resistance among strains of *E coli* found in neonatal blood cultures.^{6–9} The five risk factors for development of early-onset GBS sepsis in newborns are: over 18-hour rupture of membranes, pyrexia higher than 38°C, premature labour at less than 36 weeks, GBS bacteriuria at anytime during pregnancy, or previous child with invasive GBS disease.¹



Given the presence of any potential risk factor or the presence of an antepartum (35–37 weeks) swab positive for GBS, mothers are treated with intrapartum antibiotic prophylaxis to protect the infant from GBS sepsis.⁸

According to the Active Bacterial Core (ABCs) surveillance system in the USA, early-onset GBS disease rates trended downwards from 2000 to 2003 before noticing an increase from 2003 to 2006 fuelled primarily by a significant change in incidence levels for black infants. However, the incidence of late-onset GBS disease remained stable throughout the observational period (2000–2006).⁶

Recent studies from the USA have shown a change in neonatal infection patterns with a reduction in GBS sepsis and an increase in *E coli* ampicillin resistance.^{3,5,6,10} These studies have identified an urgent need to better understand the changing epidemiology of neonatal sepsis in a post-intrapartum antibiotic prophylaxis era.^{8,9}

Currently there is very limited Canadian data with respect to sepsis affecting newborn infants. This includes surveillance of nosocomial infection among Canadian neonatal intensive care units. The Memorial University of Newfoundland was able to conclude that the considerable variance in the rate of nosocomial infection across Canada could be attributed to differences in clinical practices.² Understanding the neonatal infection pattern in Canada is of paramount importance with regards to both maternal intrapartum antibiotic guidelines and neonatal management.¹

Methods

Through the established methodology of the CPSP, over 2,500 paediatricians and paediatric subspecialists will be actively surveyed on a monthly basis to report cases of early-onset neonatal sepsis and meningitis. A detailed clinical questionnaire will be completed for reported cases.

It is acknowledged that positive blood culture in the first seven days of life could be nosocomially acquired. An adjudication process was set up to help identify these cases and review them on a case-by-case basis.

Objectives

- 1) Determine incidence of early-onset neonatal sepsis and meningitis in Canada.
- 2) Determine types of bacteria and corresponding resistance patterns in early-onset neonatal sepsis and meningitis.
- 3) Collect information on risk factors for sepsis and meningitis, and information on maternal antibiotic treatment.

Case definition

Report any neonate less than seven days of age presenting with one of the following:

- Positive blood culture*

AND/OR

- Positive cerebrospinal fluid (CSF) culture* from a lumbar puncture (LP)

Neonates with possible nosocomial infections should also be reported.

* Culture growth includes bacterial or fungal pathogens.



Early-onset neonatal sepsis and meningitis (continued)

Exclusion criteria

- 1) Neonates who are asymptomatic with positive culture, such as coagulase-negative Staphylococcus, Diphtheroids, Corynebacterium spp., Bacillus spp., Propionibacterium spp., Aerococcus spp., Micrococcus spp.
- 2) Positive CSF from a drain, reservoir, shunt, or intracranial surgical procedure.

Duration

January 2011 to December 2012

Expected number of cases

Taking in consideration the incidence of early-onset neonatal sepsis is 1–2 per 1,000 live births, and approximately 360,900 births per year in Canada (2006-2007 data),¹¹ we anticipate about 300–700 cases per year.

Ethical approval

St. Michael's Hospital, University of Toronto

Analysis and publication

Analysis will be completed six months after study completion. Interim data will be presented at paediatric meetings, particularly the Canadian Paediatric Society's Annual Conference and the Pediatric Academic Societies' Annual Meeting (PAS). Peer-reviewed publication will be pursued.

References

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