Pneumococcus

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KEYWORDS

• Pneumococcus • *Streptococcus pneumoniae* • Bacterial pneumonia
• Invasive pneumococcal disease • Bacterial illnesses • Antibiotic resistance
• Immunization • Treatment

KEY POINTS

- The peak incidence of pneumococcal illness occurs in the very young and in the elderly. Human immunodeficiency virus and asplenia are also key risk factors.
- The virulence of a particular pneumococcal organism depends on the serotype of its capsule.
- Pneumococcus is the most common cause of pneumonia in hospitalized patients and may be the most common bacterial cause in the outpatient setting as well.
- Despite advances in antibiotics and critical care, pneumococcal bacteremia remains a mortal and morbid disease, particularly for those patients with septic shock.
- Although the rate of change of pneumococcal antibiotic resistance has slowed, it continues to increase.
- Selective pressure by immunization may be resulting in an increase in pneumococcal disease caused by serotypes not included in the vaccines as well as the antimicrobial resistance of those serotypes.
- The Advisory Committee on Immunization Practices now recommends that patients with immunocompromising conditions, functional or anatomic asplenia, cerebrospinal fluid leaks, or cochlear implants who have not previously received pneumococcal conjugate vaccine 13 (PCV13) or 23 valent polysaccharide vaccine (PPSV23) be given PCV13 first followed by PPSV23 8 weeks later.

OVERVIEW

Streptococcus pneumoniae is one of the most common bacterial pathogens encountered in medicine.[1] First isolated in 1881 by Louis Pasteur, pneumococcus, as it is commonly known, continues to be an important cause of mortality and

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morbidity in all age groups, from children to the elderly, both in the United States and worldwide.[2]

EPIDEMIOLOGY

The rates of infection with *S pneumoniae* vary widely depending on how infection is defined. In general, invasive pneumococcal disease is defined as an infection confirmed by the isolation of *S pneumoniae* from what is normally a sterile site, such as in the case of meningitis or bacteremia. Noninvasive disease thus includes all other clinical *S pneumoniae* infections from nonsterile sites such as pneumonia and the respiratory tract. Rates of colonization include patients from whom *S pneumoniae* is isolated, but who do not have clinical disease. The most recent estimate of invasive disease in the United States is 12.9 cases per 100,000 population per year, and the estimated death rate caused by invasive *S pneumoniae* infections is 1.3 per 100,000 population per year.[3]

Noninvasive infection rates are more difficult to quantify, in part because of the high rates of colonization by *S pneumoniae* in both healthy and sick individuals.[4,5] Colonization in ill patients poses a particularly challenging problem because it is may be unclear whether, for example, a patient's underlying pneumonia is caused by *S pneumoniae* or whether there is another pathogen present and *S pneumoniae* is isolated as an innocent bystander from the patient's upper respiratory tract. *S pneumoniae* has been isolated from the nasopharynx of as many as 24% of patients with pneumonia, and even experts have, in the same year, offered estimates of the rates of pneumonia directly attributable to *S pneumoniae* infection that range from 31.6 to 500 cases per 100,000 population per year.[6,7]

RISK FACTORS

Perhaps easier to discern than the overall rates of infection with *S pneumoniae* are the risk factors for both invasive and noninvasive disease. Although outbreaks were common in the past and still happen occasionally, such as a well-known occurrence at an overcrowded jail in 1994, most infections with *S pneumoniae* are sporadic.[8] The peak incidence of pneumococcal infections occurs in young children and in the elderly, with the current estimates for incidence of invasive disease being 31.4 cases per 100,000 per year in patients less than the age of 1 year and 37.0 cases per 100,000 per year in patients older than 65 years.[2,9] Young patients, especially those younger than 2 years, are at particular risk because of their lack of immunoglobulin (Ig) G2.[10] Other risk factors include hypogammaglobulinemia, complement deficiency (especially deficiency of C3b), asplenia, nephrotic syndrome (caused by the loss of serum complement and IgG), diabetes, alcoholism, cirrhosis, and nonhematologic malignancies.[10] There are also associations between *S pneumoniae* infections and chronic obstructive pulmonary disease, heart failure, cerebral vascular disease, epilepsy, dementia, cigarette smoke, recent hospitalization and institutionalization, and human immunodeficiency virus (HIV).[11,12]

As risk factors, both HIV and asplenia warrant particular attention. With regard to HIV, the rate of pneumococcal pneumonia is 5.5 to 17.6 times higher in patients with acquired immunodeficiency syndrome (AIDS), and in one study the rate of pneumococcal bacteremia in patients with AIDS was 9.4 per 1000 population per year, compared with 0.07 per 1000 population per year in patients aged 20 to 55 years.[12] The clinical presentation of pneumococcal pneumonia is similar in patients with HIV to those without HIV, although blood cultures may be more sensitive in patients with HIV compared with patients who are not infected with HIV. Also, patients with HIV are more likely to be