Journal of Infection (2011) **63**, 434—440

BIAM British Infection Association

www.elsevierhealth.com/journals/jinf

Incidence of invasive pneumococcal disease among elderly people in Southern Catalonia, Spain, 2002—2009: An increase in serotypes not contained in the heptavalent conjugate vaccine

Olga Ochoa-Gondar*, Angel Vila-Corcoles

Primary Care Service of Tarragona-Valls, EPIVAC Study Group, Institut Catala de la Salut, Av. Prat de la Riba 39, 43001 Tarragona, Spain

Accepted 21 August 2011
Available online 24 August 2011

KEYWORDS
Incidence;
Pneumococcal invasive disease;
Elderly;
Pneumococcal vaccines;
Serotype coverage

Summary Population-based surveillance study conducted among persons $\geq$ 65 years old in Southern Catalonia, Spain during 2002—2009. All cases with isolation of pneumococcus from normally sterile bodily fluids were included. Incidence rates of invasive pneumococcal disease (IPD) as well as rates of infections caused by serotypes included in the heptavalent pneumococcal conjugate vaccine (PCV7) and the 23-valent polysaccharide pneumococcal vaccine (PPV23) were compared for early (2002—2005) and contemporary (2006—2009) periods. Mean incidence rate (per 100,000 population-year) of IPD across study period was 48.0 [95% CI (confidence interval): 30.1—72.5]. Incidence rates for PCV7 serotypes slightly decreased by 21% between 2002—2005 and 2006—2009 (from 9.2 to 7.3; $p = 0.511$) whereas rates of IPD due to nonPCV7 serotypes largely increased by 172% (from 15.6 to 42.4; $p < 0.001$) during the same period. For PPV23 but nonPCV7 types, incidence rates increased by 146% (from 10.9 to 26.9; $p < 0.001$) whereas rates for nonPPV23 serotypes increased by 237% (from 4.6 to 15.5; $p = 0.001$). As an overall effect of these changes, the incidence of all IPD increased by a significant 69% (95% CI: 29%—110%). Specific incidence rates of serotypes 6A (from 1.7 to 4.1; $p = 0.182$), 7F (from 1.7 to 5.7; $p = 0.052$) and 19A (from 0.6 to 6.2; $p = 0.004$) substantially increased between both periods. According to these findings, Southern Catalonia region can be classified as a mesoendemic area of pneumococcal infections among elderly people, with a recent increase incidence of some nonPCV7 serotypes (especially 19A).

* Corresponding author. Tel.: +34 977240666; fax: +34 977226411.
E-mail address: oochoa.tarte.ics@gencat.cat (O. Ochoa-Gondar).

0163-4453/$36
doi:10.1016/j.jinf.2011.08.013

Introduction

Infection caused by *Streptococcus pneumoniae* remains an important public-health problem throughout the world. Disease presentation depends on whether the bacteria spreads to adjacent mucosal tissues causing mucosal infections (otitis, sinusitis, bronchitis and nonbacteraemic pneumonias) or whether it invades the bloodstream, or other sterile sites, resulting in invasive pneumococcal disease (IPD), basically bacteremic pneumococcal pneumonias, meningitis and sepsis. Susceptibility to pneumococcal infections varies with age, being highest among young children and elderly people (i.e., aged 65 years or older).[1]

The true incidence of overall pneumococcal infections is unknown because most non-invasive infections remain undiagnosed. However, it has been estimated that approximately 1.6 million people die from pneumococcal diseases each year throughout the world.[2] In European countries, the reported incidences of IPD have widely varied in different studies, ranging from 0.4 to 20 cases per 100,000 all-age inhabitants per year. Among elderly populations, the reported incidences of IPD varied between 20 and 76 cases per 100,000 persons-year.[3,4] Although these differences can largely reflect different rates of obtaining blood cultures from patients with pneumonia, they can also reflect methodological, geographical and epidemiological differences.

At the moment, pneumococcal vaccination (together with influenza vaccination and smoking cessation) is the only public-health measure to reduce the burden of pneumococcal disease. Currently, two types of pneumococcal vaccine are available: a polysaccharide pneumococcal vaccine (PPV23) for use in adults and some pneumococcal conjugate vaccines (PCVs) for use in children. Possible indications for using PCVs in adults are under evaluation by regulatory and public-health officials.[5] In contrast to the PPV23 (licensed in 1983) that had shown only a limited impact on the pneumococcal disease burden,[6] the introduction of the PCV7 (licensed in 2000 for use in children) initially provided very encouraging results.[7] Apart from an overwhelming effect in children, a considerable protective indirect effect by herd protection was reported in parents and grandparents during the early period after PCV7 licensure.[8,9] Later, serotype replacement and emerging serotypes were observed,[10–12] and two new conjugate vaccines including progressively more serotypes (PCV10 and PCV13) were licensed in 2010 to substitute the "old" PCV7.[13,14]

The introduction of PCV7 in many countries has dramatically reduced the incidence of pneumococcal diseases in children, and older adults currently suffer the highest epidemiological burden of the pneumococcal disease.[4,12] Since children are the main reservoir for pneumococci, and they represent the source of pneumococci that is spread to adults (especially to the elderly population), updated data on epidemiology of pneumococcal infections in adult populations before and after conjugate vaccine introduction are greatly needed for different geographical settings. These studies should provide important data to evaluate the possible direct and indirect impact of anti-pneumococcal vaccination programmes.

In Catalonia (a region in Northeast Spain with almost seven million people), a publicly funded anti-pneumococcal vaccination program for high-risk adults and all elderly people (65 years or older) began in October 1999. Since then, a free PPV23 is offered when the patients came to the Primary Care Centres during the annual influenza vaccination campaigns or in any other visit throughout the year. In the study region, among the general elderly population, PPV23 uptakes increased quickly up to 44% in 2001.[15] Since then PPV23 uptakes have increased more slowly, reaching approximately 60% in 2009 (unpublished data). If we consider conjugate vaccine for children, PCV7 was licensed in Catalonia in June 2001, but it was not included in the routine pediatric vaccination schedule (except for children who were at a high risk of IPD). However, PCV7 has been administered throughout the private sector among children aged <2 years, with a gradual increase of vaccination uptakes. In the study region, PCV7 uptake among infants increased from 13% in 2002 to 47% in 2005,[16] but since then vaccine uptakes have hardly increased. This data provides an excellent opportunity to evaluate the evolution of serotype causing IPD among an elderly population with a relatively high PPV23 uptake and living in a community with moderate PCV7 uptake among children. The present study analyzes incidences of IPD among persons 65 years or older in the region of Tarragona (Southern Catalonia, Spain) and examines changes in disease pattern throughout the 2002–2009 period.

Methods

Population-based surveillance study that included all cases of IPD (isolation of pneumococcus from normally sterile bodily fluids) observed during 2002–2009 among persons 65 years or older in the region of Tarragona (a mixed residential-industrial area in the Mediterranean coast of Southern Catalonia, Spain) with an overall population, according to 2006 census data, of 337,289 all-age inhabitants.[17]

IPD cases were identified from an active surveillance made in the 19 Primary Care Centres and two Laboratory Departments of the reference hospitals in the study area (Joan XXIII and Santa Tecla Hospitals) from January 1, 2002 to December 31, 2009. The study was approved by the ethical committee of the Catalonian Health Institute and was conducted in accordance with the general principles for observational studies. IPD was defined as a patient, living in the study area, from whom *S. Pneumoniae* was obtained by culture of blood samples, CSF samples, or other normally sterile sites. The PCC's and Hospital's discharge diagnoses databases, coded according to the International Classification of Diseases, 9th Revision, Clinical modification (ICD-9), were initially used to identify possible IPD cases. IPD was identified on the basis of ICD-9 codes for sepsis (038.2), bacteremia (041.2), meningitis (320.1), pneumonia (481), peritonitis (567.1) and arthritis (711.0). Laboratory records were also used to identify cases of pneumococcal infections not detected in ICD-9 discharge codes. All the cases were validated by review of the medical record with the use of standardized data-collection instrument. Potential IPD cases were only definitively included if, on conclusion of the medical record review, the physician reviewer verified the diagnosis. All IPD cases were classified according to presentation in different clinical syndromes: meningitis, sepsis, x-ray