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The current burden of pneumococcal disease in England and Wales

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Summary *Objective*: To evaluate the potential impact of various pneumococcal conjugate vaccination strategies, it is critical to ascertain the pre-vaccination epidemiology and to have a detailed evaluation of the current burden of pneumococcal disease.
Method: A variety of national data sources and GP sentinel surveillance systems were used to estimate the incidence, number of hospital admissions, deaths, and GP consultations due to pneumococcal disease in England and Wales. Clinical outcomes included pneumococcal meningitis, bacteraemia, pneumonia and otitis media. A statistical model was used to attribute GP consultation recorded as pneumonia and acute otitis media to specific aetiological causes when these were not recorded.
Results: The burden of pneumococcal disease is considerable, with incidence rates of both invasive and non-invasive disease peaking in children (<5 years) and in the elderly (75+ years). Around 5800 hospitalisations specifically mentioning *Streptococcus pneumoniae* are estimated to occur annually in England and Wales, almost 40 000 for lobar pneumonia and over 15 000 for otitis media. There may be an additional 70 000 GP consultations for pneumococcal related community acquire pneumonia and over 630 000 for otitis media. A significant proportion of hospitalisations and GP consultations for pneumococcal disease occur among high-risk groups, with over 80% of hospital admissions reporting more than one diagnosis.

Introduction

Streptococcus pneumoniae is a bacterial pathogen normally residing in the nasopharynx which causes a wide range of invasive and non-invasive diseases, the most important of which are: meningitis,

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septicaemia, pneumonia and otitis media. The burden of invasive pneumococcal (Pnc) disease (IPD) is high worldwide, with reported incidence rates ranging from 23.2 per 100 000 in the U.S.A.[1] (166 in <2 years of age) to around 10 per 100 000 in European countries.[2] In developing countries extremely high incidence rates of IPD have been reported among infants (139–224 per 100 000 in <2 years of age)[3] as well as among indigenous adult populations (190 per 100 000 in 65+ years of age)[4] Less serious non-invasive pneumococcal disease (non-IPD) represents most of the pneumococcal conditions and is much more difficult to estimate. Microbiological confirmation of *S. pneumoniae* infection is both difficult and often not performed; hence the aetiological cause remains unknown. Estimates from previous studies suggest that 15–43% of community-acquired pneumonia (CAP) cases are attributable to pneumococcal infection;[5] around 30–35% of acute otitis media (AOM) has been attributed to Pnc.[6,7]

A pneumococcal conjugate vaccine (PCV) has been proved to be safe and effective against the most serious form of pneumococcal infection[8–11] and also moderately effective against AOM[12,13] and pneumonia.[14,15] Widespread vaccination has been introduced in the U.S.A.[16] whereas in the U.K. the vaccine is currently recommended only for children less than 5 years of age with specific high-risk conditions.[17] Moreover, since, July 2003, a pneumococcal immunisation program for the healthy elderly with a 23-valent polysaccharide vaccine has also been introduced in England (www.dh.gov.uk) in addition to the previous policy of vaccinating high-risk individuals over 2 years of age.

The aim of this work is to estimate the amount of pneumococcal disease that is present in England and Wales in order to provide baseline information for the assessment of the potential benefits that may derive from vaccination.

Methods

Data sources

Laboratory reports

The enhanced surveillance of pneumococcal disease set up jointly between the Communicable Disease Surveillance Centre's (CDSC) national laboratory reporting scheme and the Respiratory and Systemic Infection Laboratory (RSIL) at the Specialist and Reference Microbiology Division of the Health Protection Agency is the main data source for the ascertainment of the burden of IPD in England and Wales.[18,19] The system was set up in 1996 in order to improve the estimate of the burden of IPD throughout England and Wales and to gain further information on serotype distribution and disease incidence in different age groups. From this national surveillance system, cases of laboratory confirmed IPD (pneumococcal bacteraemia and meningitis) reported from laboratories around England and Wales from January 1996 to December 2000 were extracted. The extracted data included age, sex, earliest specimen date, serogroups and serotype (when available), antimicrobial susceptibility information (penicillin and erythromycin), region and method of confirmation.

Hospital episode statistics (HES)

Hospital episode statistics (HES—department of health) (http://www.dh.gov.uk) is a computerised hospital discharge database that covers all National Health Service Hospitals in England. It contains information on individual episodes of illness, together with patient details (age, date of birth, postcode, sex), clinical conditions, number of days spent in the hospital and admissions to intensive care unit (ICU). For each record, seven diagnostic fields are available, in which the condition(s) of each patient are specified using the tenth revision of the International Classification of Disease coding system (ICD-10). All hospital admissions that occurred over the period April 1995–March 2000 which included an occurrence of one of the pneumococcal related ICD-10 codes (Table 1) in

Table 1 International classification of diseases (ICD) codes for pneumococcal related disease

Definition	ICD-9 code	ICD-10 code
Pneumococcal meningitis	3201	G001
Pneumococcal septicaemia	0382	A403
Pneumococcal pneumonia	481	J13X
Lobar pneumonia, organism unspecified	481	J181
S. pneumoniae as the cause of the disease	410	B953
Non-suppurative otitis media	3810–3814	H650–H659
Suppurative and unspecified otitis media	3820–3829	H660–H669
Otitis media in diseases classified elsewhere	n.a.	H670–H678

n.a., no equivalent ICD-9 code was available.