



**PEDIATRIC INFECTIOUS  
DISEASE SOCIETY OF THE  
PHILIPPINES**

# PIDSP JOURNAL

**Vol.10 No.1  
January-December 2009**

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## PNEUMOCOCCAL SEROTYPES AMONG FILIPINO CHILDREN ADMITTED IN A TERTIARY CARE CENTER FOR INFECTIOUS DISEASES FROM 2000 TO 2005

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### ABSTRACT

*Streptococcus pneumoniae* (SP) infections cause substantial morbidity and mortality especially in young children; therefore, prevention is of importance. Knowledge of the prevailing pneumococcal serotypes is necessary to formulate recommendations regarding use of pneumococcal conjugate vaccine. Fifty four invasive isolates from patients admitted to the Research Institute for Tropical Medicine, one of the tertiary care centers for infectious diseases of the Department of Health, during the years January 2000 to August 2005 were serotyped. Hospital medical records of children with invasive SP infections were reviewed.

Thirty of the 54 isolates were available for serotyping and represented 11 serotypes. Three serotypes/serogroup (6,18,14) were responsible for 50% of infections. Sixty seven percent of the serotypes were included in the 7-valent pneumococcal conjugate vaccine. Invasive pneumococcal disease was an important cause of infections particularly in children less than 2 years of age. The most common diagnosis of invasive pneumococcal disease was pneumonia. There was significant mortality associated with IPD. Immunization with pneumococcal conjugate vaccine will help prevent infections in Filipino children.

### INTRODUCTION

*Streptococcus pneumoniae*, the pneumococcus, is one of the most common etiologic agents of community-acquired pneumonia, febrile bacteremia, and bacterial meningitis in children. It accounts for over 1 million deaths annually among children

worldwide, mostly in developing countries, where the pneumococcus remains as one of the most clinically relevant pathogens<sup>1</sup>. In the Philippines, pneumonia is the number one cause, while meningitis and septicemia are among the top 10 leading causes of mortality among children ages 1 to 4 years<sup>2</sup>.

Use of antibiotics and immunization against pneumococcal diseases is, therefore, the cornerstone in managing infections caused by invasive *Streptococcus pneumoniae*. Despite the discovery and introduction of newer antibiotics that act against *Streptococcus pneumoniae*, drug-resistance has been reported in ever increasing numbers, causing a major worldwide concern<sup>3,4</sup>.

Growing resistance to drug seen in the pneumococcus underscores the importance of immunization to prevent diseases caused by invasive *Streptococcus pneumoniae*. The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) are spearheading a more comprehensive and aggressive immunization strategy that aims to increase coverage and reduce mortality by, among other initiatives, introducing new vaccines<sup>5</sup>. This global program is especially important to developing countries, like the Philippines, where morbidity and mortality rates are high. As a result, the use of pneumococcal conjugate vaccines has been newly instituted in this country.

Information on the prevailing types of *Streptococcus pneumoniae* is necessary to guide health care practitioners in their decision concerning use of such vaccines. This report describes and characterizes the pneumococcal serotypes seen among Filipino children with infectious diseases

Keywords: streptococcus pneumoniae, pneumococcal serotypes, invasive pneumococcal disease

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and admitted at a tertiary care center in the Philippines.

## MATERIALS AND METHODS

From January 2000 to December 2005, 54 invasive *Streptococcus pneumoniae* isolates were identified by the Department of Microbiology from children admitted at the Research Institute for Tropical Medicine (RITM), one of the tertiary care centers for infectious diseases of the Department of

Health. The identity of the isolates was confirmed by colony morphology, Gram's stain, and susceptibility to ethylhydroxycuprein (optochin). The isolates were stored in skim milk at  $-70^{\circ}\text{C}$  until further examination.

*Streptococcus pneumoniae* was serotyped using the WHO standard method of employing Quellung reaction with the use of specific antisera from the Staten's Seruminstitut (Copenhagen), Denmark.

Antimicrobial susceptibility testing was done by the Kirby Bauer disk diffusion method on Mueller Hinton agar enriched with 5% sheep blood. The following antimicrobial agents were tested: penicillin, tetracycline, ofloxacin, trimethoprim-sulfamethoxazole, chloramphenicol, rifampicin, vancomycin, erythromycin, and clindamycin. The methodology for determining antimicrobial resistance by Disk Diffusion Method was adapted from the Clinical Laboratory Standards Institute (CLSI) antimicrobial susceptibility testing standards<sup>6</sup>.

The median age of patients was 6 months (range: 1 month to 11 years); 22 (73%) were male. Twenty-seven (90%) of the patients were <2 years of age and 77% were <1 year of age. Diagnoses were as follows: bacteremic pneumonia in 52%, meningitis in 30%, measles-associated complicated pneumonia in 11%, and bacteremia in 7%. Nine of the 27 patients died, giving a mortality rate of 33%.

## RESULTS

Thirty of the 54 isolates were available for serotyping and represented 11 serotypes

(see Table 1). Three serotypes—6, 18, and 14, were responsible for 50% of infections. Sixty-seven percent of the serotypes were included in the 7-valent pneumococcal conjugate vaccine.

**Table 1: Serotype Distribution of Invasive *Streptococcus pneumoniae* in Filipino Children (RITM, 2000 - 2005).**

SEROTYPE	NUMBER (%)
6 *	6 (20)
18 *	5 (17)
14 *	4 (13.3)
5	4 (13.3)
9 *	3 (10)
20	3 (10)
1	1 (3.3)
2	1 (3.3)
4 *	1 (3.3)
19 *	1 (3.3)
38	1 (3.3)
<b>TOTAL</b>	<b>30 (100)</b>

\*Serotypes included in 7-valent pneumococcal conjugate vaccine

Of the 54 isolates, the resistance rates were as follows: penicillin at 3.7%; tetracycline at 3.7%; and trimethoprim-sulfamethoxazole at 22.2% (intermediate and resistant categories were 18.5% and 3.7%, respectively). No resistance was observed with chloramphenicol, erythromycin, ofloxacin, rifampicin, clindamycin, and vancomycin. No specific serotype was identified with any particular antibiotic since there were only a few resistant isolates.

## DISCUSSION

Information on the population-based incidence of *Streptococcus pneumoniae* in the country would be ideal. However, such information is unavailable in the Philippines. Nevertheless, *Streptococcus pneumoniae*, together with *Haemophilus influenzae*, continues to be one of the most important causes of severe pneumonia and bacterial meningitis in Filipino children<sup>7,8,9</sup>.

Because the predominant pneumococcal serotypes vary from country to country,

country-specific knowledge of serotypes is crucial<sup>10, 11, 12</sup>. From 1988 to 1999, the 7-valent pneumococcal conjugate vaccine covered 48% of the isolates<sup>7</sup>. However, in this report, the vaccine yielded 62%. Moreover, in the previous study, serotypes 1, 6 and 23 were the most common<sup>7</sup>. In contrast, this report demonstrated the prevalent serotypes to be 6, 18, and 14. Serotype 1, predominant in the previous study was found only in 1 patient in the present one. Reports of variation in the serotype distribution have been noted in the past<sup>13, 14</sup>.

Significant mortality continues to be associated with invasive pneumococcal disease. This report confirms that *Streptococcus pneumoniae* remains to be a very important causative agent of invasive infections in young children. Furthermore, it substantiates the value of immunization with pneumococcal conjugate vaccine among Filipino children to reduce overall morbidity and mortality.

#### ACKNOWLEDGEMENTS

The authors would like to thank the staff of the Department of Microbiology of the Research Institute for Tropical Medicine. This study was supported by a grant from Wyeth Philippines, Inc.

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