

The serological types of streptococcus pneumoniae isolated from patients with systemic diseases.

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A total of 231 pneumococcal strains was isolated at Chulalongkorn Hospital, Bangkok, during from the peroid of January 1980 to January 1984 as follows : 145 strains (62.8%) from blood, 47 (20%) from cerebrospinal fluid, 28 (12%) from pleural fluid and 11 (4.8%) from peritoneal fluid. The infection is most common in young children from the age of 1 month to 5 years, and in those over 60 years, 72 strains (33.8%) and 25 (11.7%) respectively. Serotyping was performed in 141 strains; 26 different serotyping were demonstrated. The most common 5 serotypes (Danish Nomenclature) were : types 1, 19, 6, 5, 23, which accounted for 30 strains (21%), 14 (9.9%) 12 (8.5%) 10 (7%) and 8 (5.5%) respectively.

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ในช่วงเดือนมกราคม พ.ศ. 2523 ถึงเดือนมกราคม พ.ศ. 2527 ได้ศึกษาแยกเชื้อสเตรปโตคอคคัส นิวโมนิอิ 231 สายพันธุ์จากเลือด, จากน้ำไขสันหลัง, น้ำจากปอด, น้ำจากช่องท้อง ร้อยละ 62.8, 20, 12 และ 4.8 ตามลำดับ พบเชื้อในเด็กอายุ ≤ 5 ปี ร้อยละ 33.8 และ ในผู้ใหญ่อายุมากกว่า 60 ปี ร้อยละ 11.7 ในจำนวน 141 สายพันธุ์นี้ตรวจหาไทพ์ พบไทพ์ 1, 19, 6, 5 และ 23 ร้อยละ 21, 9.9, 8.5, 7.0 และ 5.5 ตามลำดับ, ไทพ์ 6 และ 19 พบบ่อยในเด็ก

การศึกษานี้จะเป็นข้อมูลที่เป็นประโยชน์ต่อการวินิจฉัยโรค และการประยุกต์วัคซีนในอนาคต

The pneumococcal typing system is based on the differences in capsular antigens. There are 83 serological types according to the Danish system nomenclature.⁽¹⁾ Many reports aimed to study the epidemiology of disease causing pneumococcal type.⁽²⁻⁴⁾ The knowledge was necessary for administration of pneumococcal vaccine. This study covered four years of investigation on pneumococcal serotypes from specimens collected at Chulalongkorn Hospital, Bangkok.

Materials and Methods

Pneumococcal strains: Pneumococci from blood, cerebrospinal (CSF), pleural and peritoneal fluid were included in the study.

Identification of pneumococcal strains: Pneumococci were identified by colonial and cellular morphology and sensitivity to optochin (BBL, Baltimore).

Typing of pneumococci: Pneumococci isolated on blood agar plates (37°C, 5% CO₂) and subsequently inoculated into brain heart infusion broth for about 4 hours, were typed by the behaviour in the capsular reaction test⁽¹⁾ using pooled pneumococcal anti-sera A to I and 46 pneumococcal typing sera obtained from the Statens Serum Institut Copenhagen, Denmark.

Results

Over a four-year period (January 1980 to January

1984) 231 strains of pneumococci were isolated and their serotypes were determined from blood (145 strains), cerebrospinal fluid (47 strains), pleural fluid (28 strains) and peritoneal fluid (11 strains).

Pneumonia was the most common manifestation of pneumococcal infections of which 57 patients were adults. Of the 82 patients in whom pneumonia was diagnosed, pneumococci were isolated in 62 blood specimens. Patients with underlying diseases such as diabetes mellitus and leukemia were also susceptible to this infection. In children, pneumococcal infection was mostly associated with meningitis. Among the 82 strains isolated from children, 29 strains were isolated from the CSF (Table 1).

Pneumococcal infection was most frequently observed in young children less than one year of age and in elderly people, over 60 years old (Fig 1). It was more common in male than in female.

Table 2. showed the distribution of various pneumococcal types in 141 of 231 isolates. Twenty-six discrete pneumococcal serotypes were isolated. The five most frequently observed serotypes were type 1, 19, 6, 5 and 23. Serotypes 1, 19, 5 and 23 were often found in blood, whereas type 6 was predominantly encountered in CSF. Serotypes 1 and 5 were associated with infections in adults. In contrast, serotypes 6 and 19 were common in children.

Table 1. The diagnosis of the patients with pneumococcal infections.

Specimens	Total study	Diagnosis	No (C/A)*
Blood	145	Pneumonia	62 (14/48)
		Sepsis	28 (10/18)
		Underlying diseases	39 (8/31)
		Unknown	16 (3/13)
CSF	47	Meningitis	33 (21/12)
		Sepsis	3 (3/0)
		Pneumonia	2 (1/1)
Pleural fluid	28	Underlying diseases	9 (4/5)
		Pneumonia	18 (10/8)
		Empyema	1 (1/0)
Ascitic fluid	11	Sepsis	1 (1/0)
		Underlying diseases	8 (2/6)
		Cirrhosis	3 (0/3)
		Nephrotic syndrome	2 (2/0)
Peritonitis	11	Peritonitis	1 (1/0)
		Underlying diseases	5 (1/4)
Total	231		231 (82/149)

*C/A = children (< 15 years) / Adult (> 15 years)

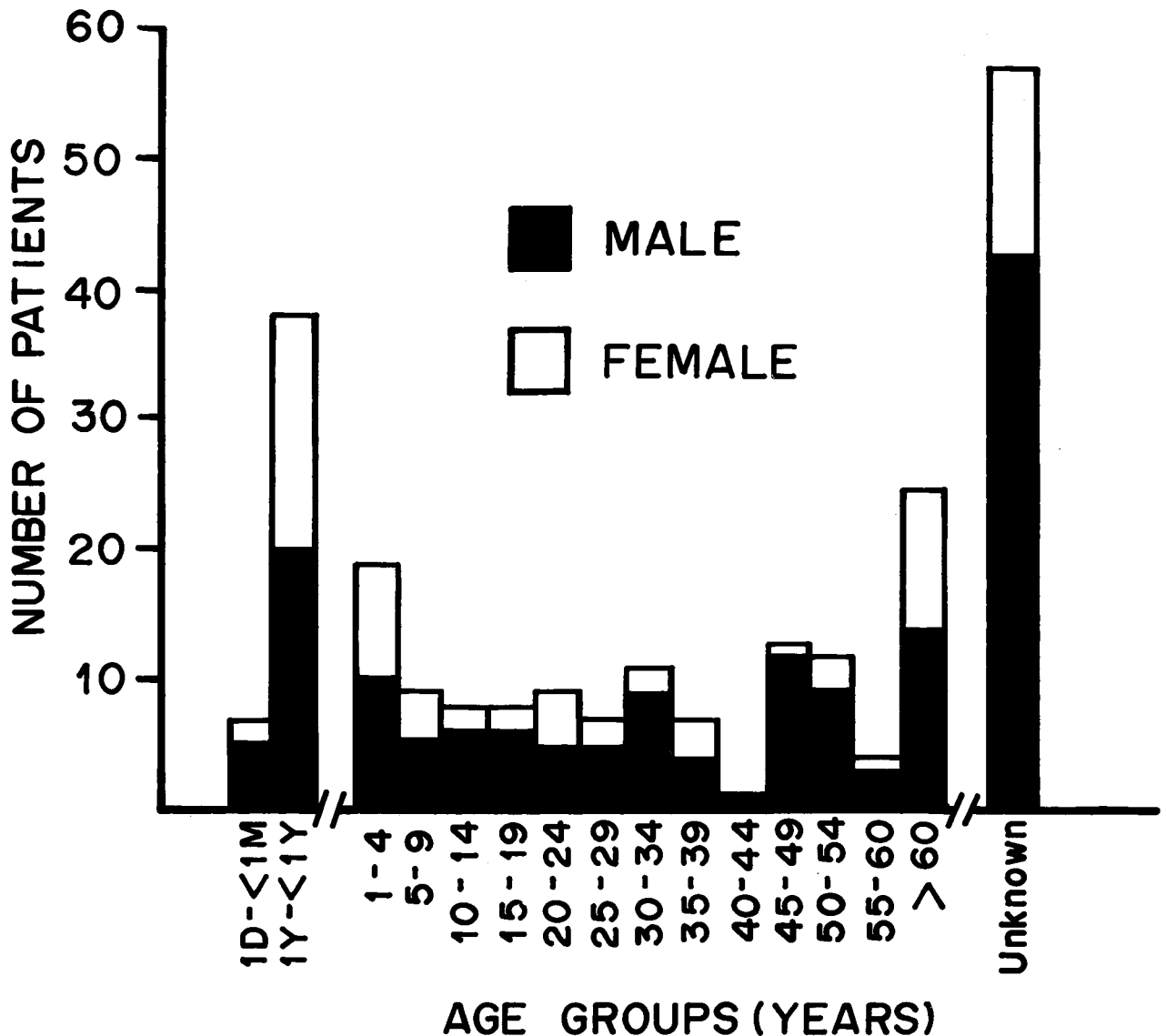


Figure 1. Age and sex of the patients with pneumococcal infections.

Discussion

In our study, bacteremia occurred in 75% of all patients who were diagnosed to have pneumonia, which was higher than that observed by Austrian.⁽⁵⁾ Serotype 1 was commonly associated with the pneumococcal infection, and it was found at a higher frequency in adults (adults: children = 23:7) which confirmed the finding of Lund.⁽⁶⁾ According to Sornchai⁽⁷⁾ serotype 1 was considered to be an infectious strain and was seldomly isolated from carriers, whereas type 6 and 19 which

occurred less frequently in infection were readily isolated from carriers. Our study revealed that serotypes 6 and 9 were the common pathogenic strains in children and serotype 6 was especially the common pathogen isolated from the CSF.

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Table 2. Serological types of pneumococci found in body fluid.

Danish type	No. of study (C/A)	Frequency	No. of Specimens		
			Blood (C/A)*	CSF (C/A)*	Pleural & Ascitic (C/A)*
1	30(7/23)	1	22(3/19)	4(2/2)	4(2/2)
19	14(9/5)	2	10(7/3)	2(2/0)	2(0/2)
6	12(11/1)	3	2(2/0)	8(7/1)	2(2/0)
5	10(1/9)	4	6(0/6)	1(0/1)	3(1/2)
23	8(4/4)	5	5(2/3)	-	3(2/1)
14	7(4/3)	6	5(2/3)	2(2/0)	-
18	7(3/4)	6	4(2/2)	2(1/1)	1(0/1)
2	6(2/4)	7	4(1/3)	1(1/0)	1(0/1)
7	5(0/5)	8	4(0/4)	1(0/1)	-
35	5(0/5)	8	1(0/1)	1(0/1)	3(0/3)
20	4(1/3)	9	2(0/2)	2(1/1)	-
3	3(0/3)	10	2(1/1)	1(0/1)	-
9	3(1/2)	10	1(0/1)	-	2(1/1)
12	3(3/0)	10	1(1/0)	2(2/0)	-
15	3(1/2)	10	3(1/2)	-	-
28	3(3/0)	10	1(1/0)	1(1/0)	1(1/0)
39	3(1/2)	10	2(1/1)	1(1/0)	-
4	2(0/2)	11	1(0/1)	1(0/1)	-
13	2(0/2)	11	2(0/2)	-	-
16	2(0/2)	11	2(0/2)	-	-
17	2(0/2)	11	1(0/1)	1(0/1)	-
24	2(1/1)	11	-	1(0/1)	1(1/0)
38	2(0/2)	11	1(0/1)	-	1(0/1)
8	1(0/1)	12	1(0/1)	-	-
11	1(0/1)	12	-	-	1(1/0)
34	1(0/1)	12	-	1(0/1)	-
Total	141(52/89)		83(24/59)	33(20/13)	25(11/14)

* C/A = children (< 15 years) / Adult (> 15 years)

References

- Lund E, Henrichsen J. Laboratory diagnosis serology and epidemiology of Streptococcus pneumoniae, In: Bergan T, Norris JR, eds. Methods in Microbiology. Vol 12. New York : Academic Press, 1978.
- Henrichsen J. The pneumococcal typing system and pneumococcal surveillance. J Infection 1979;1 Suppl 2:31-7
- Austrian R. Prevention of pneumococcal infection by immunization with capsular polysaccharides of Streptococcus pneumoniae : current status of poly valent vaccines. J Infect Dis 1977; 136 Suppl; 538-42
- Broome CV, Facklam RR. Epidemiology of clinically significant isolates of Streptococcus pneumoniae in the United States. Rev Infect Dis 1981 Mar-Apr; 3(2) : 277-82

5. Austrian R, Gold J. Pneumococcal bacteremia with especial reference to bacteremic pneumococcal pneumonia. *Ann Intern Med* 1964 May; 60(5) : 759-76
6. Lund E. Distribution of age and sex in cases of pneumococcal meningitis. *Acta Pathol Microbial Scand* 1974; 61 : 487-90
7. Sornchai C. Serotype distribution and antibiotic-resistance pattern of *Streptococcus pneumoniae* in Bangkok, Thailand. Master Thesis of Mahidol University. 1978.