

PNEUMOCOCCAL INFECTIONS : REPORT OF AHOSPITAL BASED STUDY

Khanal B¹, Sharma S K¹, Deb M¹, Bhattacharya S K¹

ABSTRACT

Seventy-one isolates of *Streptococcus pneumoniae* were obtained from various clinical specimens of sixty-six patients. Type of pneumococcal infections varied in different age groups. Major brunt of the invasive pneumococcal infection was borne by infants and children. Isolates from infected corneal ulcers were relatively resistant to antimicrobials including penicillin, as compared to those isolated from normally sterile body sites.

Key Words: *Pneumococcal infection, antimicrobial susceptibility, Eastern Nepal.*

INTRODUCTION

Streptococcus pneumoniae is a significant pathogen in human having long been recognised as a major cause of community based pneumonia, meningitis, septicaemia, otitis media, sinusitis and many other infections. Pneumococcal infections are considered as an important cause of substantial morbidity and mortality worldwide.^{1,2,3}

Although the overall incidence of pneumococcal infection is greatly reduced as compared to that of pre-antibiotic era, this disease remains as challenging as it was before. In India mortality from

invasive pneumococcal diseases exceeded 20% in a multicentre study.⁴ The relationship of this disease to age also has not changed. Young children and elderly are still a more vulnerable group. There is no easy answer to why there has not been more success in the control of pneumococcal disease.

The emergence of resistance to different antimicrobials including penicillin in a substantial proportion of pneumococci, geographical distribution, age of infection and clinical syndrome wise variation in the serotype distribution of this organism, are probably the major reasons for poor control of pneumococcal infections. Knowledge of

1. B.P. Koirala Institute of Health Sciences, Dharan, Nepal.

Address for correspondence : Dr. Basudha Khanal, Department of Microbiology
B.P. Koirala Institute of Health Sciences, Dharan, Nepal.
Email: basudhak@hotmail.com, Fax: 00977-25-20251

the extent of the pneumococcal infections and the antimicrobial susceptibility plays an important role in the choice of therapy.^{1,3} In Nepal, so far no data is available on the pattern of pneumococcal infections and their antibiogram. This prospective study was undertaken to look into the pattern of pneumococcal diseases and their antimicrobial susceptibility in Eastern Nepal.

METHODS

Various clinical specimens submitted for bacteriological culture and sensitivity to the Microbiology section of Clinical Laboratory Services of B. P. Koirala Institute of Health Sciences, a tertiary care hospital situated in Eastern Nepal from January 2000 to June 2001 were included. The specimen comprised of blood, cerebrospinal fluid (CSF), sputum, pus and corneal scrapings. Direct microscopic examination was done after gram staining of all samples except blood. Clinical specimens were cultured onto blood agar, chocolate agar and MacConkey medium. Blood agar and chocolate agar were incubated at 37°C with 5-10% CO₂ for 24-48 hours. Brain heart infusion broth was used for all blood culture samples. After 24 hours and 48 hours of incubation subcultures were done onto blood agar and MacConkey agar. The culture plates were incubated as above.

All cultures where pneumococci were grown as pure or predominant organisms were considered for further identification by standard methods.⁴ Antibiotic susceptibility test was performed against cefotaxime, chloramphenicol, cotrimoxazole, erythromycin and penicillin by standard Kirby Bauer disc diffusion methods. Oxacillin (1?g) disc was used to detect the susceptibility against penicillin.³

RESULTS

A total of 71 isolates of *S pneumoniae* were obtained from the clinical specimens of 66 patients. These were from the cases of infective keratitis (27), septicemia (14), meningitis (8), pneumonia (9), localised pus forming lesions (6), empyema (1) and infective endocarditis (1). In four patients this organism was isolated simultaneously from blood and CSF. Two out of three blood culture samples yielded this organism in the patient with infective endocarditis.

It was observed that the type of infection varied in different age groups. Keratitis was common in age group ranging between 13-65 years (median age 28 years), whereas 50% of the patients with septicaemia and meningitis were below 10 years. The youngest patient affected from septicaemia and meningitis were 13 days and 42 days respectively. Patients with pneumonia belonged to older age group (65-74 years). Isolates from corneal scrapings were relatively resistant to antibiotics as compared to those from normally sterile body sites. Details of the results are given in Tables I and II.

Table I
The number of patients with Pneumococcal infections

--

Table 2
Antimicrobial susceptibility of *S. pneumoniae*
against commonly used antimicrobials

DISCUSSION

Most of the pneumococcal infection, except the cases of infective keratitis, in the present study was observed in infants and children. This finding corroborates with the reports of studies done worldwide suggesting the prevalence of pneumococcal infection in the extremes of age.^{1,2,3} Five patients with pneumonia with positive sputum culture were above 65 years. Blood culture was not attempted in these pneumonia affected individuals. If accepted methodology is strictly followed, its presence is proved if *S. pneumoniae* is identified by blood culture. However, this method does not always yield satisfactory results since most patients with pneumococcal pneumonia do not have detectable bacteremia.¹

In postantibiotic era *S. pneumoniae* is considered as a less frequent cause of endocarditis. In the present study, this organism was isolated from 2 out of 3 blood culture samples from a case of infective endocarditis with rheumatic heart disease.

Penicillin has been the standard drug to treat pneumococcal infection for nearly half a century. In the last two decades the frequency and the degree

of resistance manifested by pneumococci to penicillin has steadily been increasing. In addition, pneumococci resistant to other antibiotics like cephalosporin, tetracyclines and macrolides have been recognised posing potential threats in the treatment of pneumococcal diseases. Variations have been observed in different geographical locations regarding the prevalence of penicillin resistance. Recently published studies indicate that it has been as low as 1.3% to 9% in India and Pakistan respectively and as high as 49% and 67% in Spain and South Korea, respectively.^{4,6,7,8}

In the present study 4% of the total pneumococcal strains showed resistance to penicillin. All the resistant strains were isolated from the cases of infected corneal ulcers. Pneumococci are harbored asymptotically in the nasopharynx by approximately 50% of the population at any given time¹. Studies have documented that isolates obtained from nasopharyngeal swab are comparatively more resistant to penicillin than isolates from blood and CSF.¹ Pneumococci infecting cornea can reach the site directly from nasopharynx without invading blood stream. That would explain isolation of penicillin resistant pneumococci from the cases of microbial keratitis and penicillin susceptible pneumococci from the cases of invasive infections. Penicillin resistance was not detected among the isolates from blood, CSF, sputum, and pus.

Rate of resistance to other commonly used antibiotics such as chloramphenicol, cotrimoxazole, erythromycin and tetracycline is much greater in penicillin resistant than in penicillin susceptible strains.^{2,3} Concomitant resistance to erythromycin, chloramphenicol and cotrimoxazole, along with penicillin resistance was observed in 7% of isolates and all those resistant isolates were obtained from infected corneal ulcers.

It is evident from the results that resistant pneumococci do exist in our set up though invasive infections are still caused by the susceptible kind. Trends indicate that pneumococci resistant to antibiotics are increasing worldwide. Therefore it may be expected that penicillin resistance may emerge sooner or later even among the isolates from invasive diseases. Although there was no penicillin resistance in the isolates in an Indian study, intermediate resistance to penicillin was confirmed in 4 (1.3%) isolates by minimum inhibitory concentration (MIC). Determination of MIC thus, helps not only in detecting the concentration required to inhibit the organism but also gives an indication of development of impending resistance. Determination of intermediate resistance by MIC was not attempted in the present study and hence can not be commented upon.

Thus, this preliminary study highlights the pattern of pneumococcal infections and the antimicrobial sensitivity in a hospital set up in Eastern Nepal. In conclusion, this subject needs a more detailed examination in future.

REFERENCES

1. Klugman KP, Tuomanen E. Pneumococcal infections, In: Guerrant RL, Walker DH, Weller PF eds. Tropical Infectious Diseases. Principles, pathogens and practice. Philadelphia : Churchill Livingstone; 1999:401-407.
2. Austrian R. Streptococcus pneumoniae. In: Gorbach SL, Bartlett JG, Blacklow NR eds. Infectious Diseases, Philadelphia : WB Saunders Company; 1999: 1719-1723.
3. Musher DM. Streptococcus pneumoniae. In: Mandell GL, Bennett JE, Dolin R eds. Principles and Practice of Infectious diseases. New York: Churchill Livingstone; 2000:2128-2147.
4. Invasive Bacterial Infection Surveillance (IBIS) Group, International Clinical Epidemiological Network (ICLEN) Prospective multicentre hospital surveillance of Streptococcus pneumoniae disease in India. Lancet 1999;353:1216-21.
5. Forbes BA, Sahm DF, Weissfeld AS, eds. Bailey and Scott's Diagnostic Microbiology. St. Louis: Mosby; 1998.
6. Ostroff SM. Continuing challenge of pneumococcal disease. Lancet 1999;352:1201-1202
7. Jacobs MR, Applebaum PC. Antibiotic-resistant pneumococci. Rev. Med. Microbiol 1995; 6:77-93.
8. Tomasz A. The pneumococcus at the gates. N Engl J Med 1995; 333:514-15.

