

BACTERIAL MENINGITIS: A FIVE YEAR (2001-2005) RETROSPECTIVE STUDY AT UNIVERSITY MALAYA MEDICAL CENTER (UMMC), KUALA LUMPUR, MALAYSIA

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Abstract. This was a five year (2001-2005) retrospective study of bacterial meningitis in patients admitted to UMMC. A total of 47 cases were analyzed. Chinese was the most common ethnic group (41%), followed by Malays (36%) and Indians (23%). The majority of cases (60%) were within the 0-9 year old age group. Within this age group, the majority (93%) was less than 5 years old. For all races, males were more commonly infected (62%) than females. The most common presenting complaints were fever (83%), vomiting (25.5%), headache (23%), seizures (23%), and loss of consciousness (11%). On admission, 23% had neck stiffness. Cerebrospinal fluid (CSF) cultures were positive for *Streptococcus pneumoniae* (23%), *Haemophilus influenzae* (15%), *Escherichia coli* (8.5%), *Neisseria meningitidis* (4%) and *Streptococcus spp* (2%). CSF investigations were not done on 47% of cases due to contraindications. The most common complication was subdural effusions (15%), followed by cerebral edema (8.5%), epilepsy (8.5%) and hydrocephalus (6%). The antibiotic sensitivity tests done showed that all the three major organisms were 100% sensitive to ceftriaxone. *S. pneumoniae* was 100% sensitive to penicillin and *H. influenzae* was 90% sensitive to penicillin and ampicillin. The mortality rate was 15%.

INTRODUCTION

Bacterial meningitis remains a common disease worldwide. The incidence of bacterial meningitis is between 3 and 5 per 100,000 people per year and more than 2,000 deaths are reported annually in the United States. The disease is even more common in developing countries. Worldwide, the three major meningeal pathogens (*Haemophilus influenzae*, *Neisseria meningitidis* and *Streptococcus pneumoniae*) account for approximately 75% to 80% of cases, but the proportion due to each organism varies among geographic regions. Nearly all cases of *H. influenzae* meningitis occur in children under 6 years of age. Meningitis due to *N. meningitidis* is most often encountered in children and young adults and may occur in epidemics. Pneumococcal meningitis is the most common type of meningitis in adults over the

age of 30; it is much less common in children than in adults over age 60 (Scheld, 1998).

Hospital-based studies show that *H. influenzae* type b (Hib) is a major cause of bacterial meningitis and/or pneumonia in the Philippines, India, Thailand, Malaysia, Indonesia and Vietnam (Lolekha *et al*, 2000).

The aim of this retrospective study was to determine the number of cases of bacterial meningitis admitted to UMMC and their clinical presentations, complications, management and epidemiology.

MATERIALS AND METHODS

The medical records of all bacterial meningitis cases admitted to UMMC, Kuala Lumpur between the years 2001-2005 were carefully analyzed. A total of 47 medical records of patients with the diagnosis of bacterial meningitis were traced. Data analysis was conducted using the SPSS program (Version 11.5).

RESULTS

Over the five year period of the study, a total of 47 cases of bacterial meningitis were

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Table 1
Bacterial meningitis distribution by age, sex and race (2001-2005) at UMMC.

Age (years)	Race						Total
	Malays		Chinese		Indians		
	M	F	M	F	M	F	
0-9	7	4	5	5	6	1	28
10-19	1		1				2
20-29	1		1				2
30-39		1	2	2	2		7
40-49		1	1		1		3
50-59		1		1			2
60-69		1	1				2
>70						1	1
Total	9	8	11	8	9	2	47
%	36		41		23		

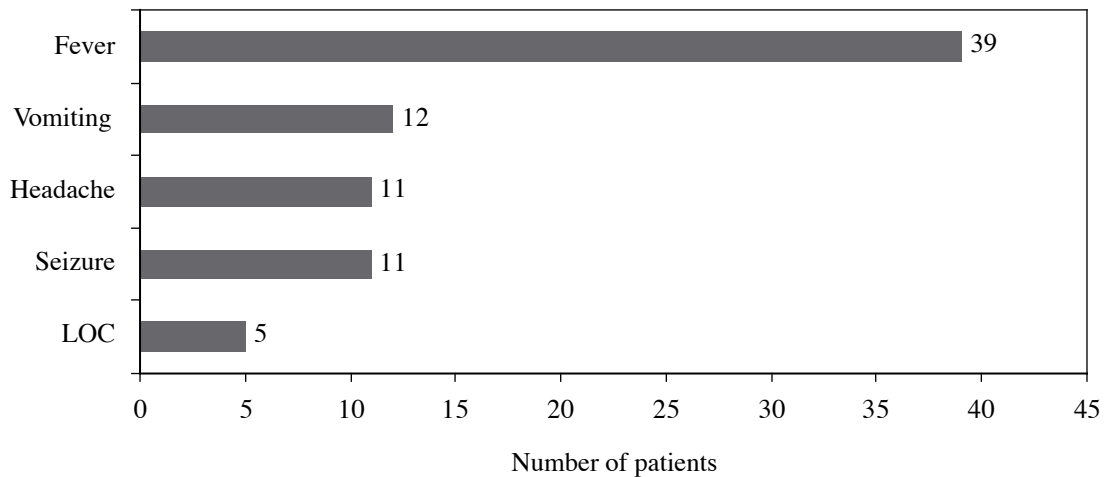


Fig 1- Top five presenting complaints in patients with bacterial meningitis.

identified. Table 1 shows that those with Chinese ethnicity were the most commonly infected group (19 cases, 41%), followed by Malays (17 cases, 36%) and Indians (11 cases, 23%). The majority of cases were within the 0-9 year old age group (28 cases, 60%). Within this age group, 26 cases (93%) were less than 5 years old. For all races, males were more commonly infected (29, 62%) than females.

The commonest presenting complaints necessitating admission to the hospital (Fig 1) were fever (83%), vomiting (25.5%), headaches (23%), seizures (23%), and loss of consciousness (LOC) (11%). On admission 23% had neck stiffness. Only 1 patient had a positive Kernig's sign on examination.

Cerebrospinal fluid (CSF) cultures were positive for *Streptococcus pneumoniae* in 11

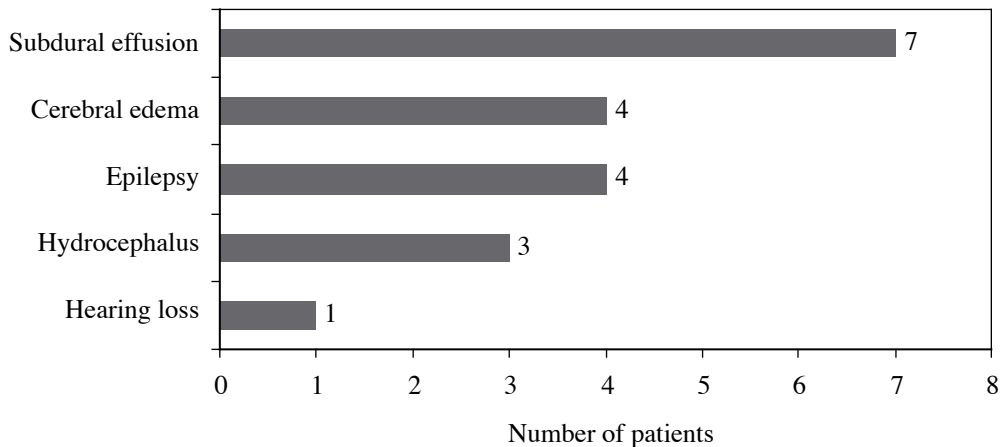


Fig 2- Top five complications in patients with bacterial meningitis.

(23%), *Haemophilus influenzae* in 7 (15%), *Escherichia coli* in 4 (8.5%), *Neisseria meningitidis* in 2 (4%) and *Streptococcus* spp in 1 (2%). *S. pneumoniae*, *H. influenzae* and *E. coli* were responsible for 47% of cases. In 22 cases (47%) CSF investigations were not done due to contraindications.

Fig 2 shows the five most common complications occurring after bacterial meningitis infection. The most common complications were subdural effusion (7 cases, 15%), cerebral edema (4 cases, 8.5%), epilepsy (4 cases, 8.5%), and hydrocephalus (3 cases, 6%) and one child had hearing loss (2%). These children later had delayed developmental milestones.

All three major causative organisms were 100% sensitive to ceftriaxone. *S. pneumoniae* was 100% sensitive to penicillin and *H. influenzae* was 90% sensitive to penicillin and ampicillin. No drug resistance was reported.

The mortality within the 5 year period of study was 15%. Thirty-five (74.5%) patients had at least one follow-up after being discharged from the hospital.

DISCUSSION

Children less than five years old were the most prevalent group in this study. The majority

(60%) of cases were within the 0-9 year age group. Within this age group, 26 cases (93%) were less than 5 years old. This is also true for most other studies done on the prevalence of bacterial meningitis in Malaysia (Urwin *et al*, 1994). Hussain *et al* (1998) reported the overall incidence of childhood meningitis in the first 5 years of life was 76.7/100,000/year. The mortality rate was 12.5% and 21 patients (30%) suffered neurologic sequelae.

The majority of the cases were ethnic Chinese (41%), followed by the Malays (36%) and Indians (23%). Factors such as poverty, overcrowding and the lack of use of health care may contribute to the increased incidence (Bedford *et al*, 2001). The most common presenting complaints on admission were fever, vomiting, headache and seizures. Choo *et al* (1990) also reported similar findings in a study done in 1990 on hospitalized children in Kelantan.

The three major organisms responsible for bacterial meningitis in this study were *S. pneumoniae* (23%), *H. influenzae* (15%) and *E. coli* (8.5%). Choo *et al* (1990) reported *H. influenzae* as the most common spp (50%) followed by *S. pneumoniae* (22%) and *N. meningitidis* (5%). *S. pneumoniae*, *H. influenzae* and *E. coli* were responsible for 47% of cases. These three major causes of bacterial

meningitis were most common in children under five years old, especially in infants over one month of age. *S. pneumoniae* and *H. influenzae* were most prevalent in children under five years of age whereas in adults over age 20, *N. meningitidis* was the most common cause. Upper respiratory tract viral infections and Hajj pilgrimage are associated with invasive meningococcal disease (Raja *et al*, 2006). Lim *et al* (1994) reported meningitis caused by *Salmonella meningitis*. Urwin *et al* (1994) reported that 88% of bacterial meningitis cases in the North East Thames Region were caused by *N. meningitidis*, *H. influenzae* and *S. pneumoniae*.

Hospital-based studies show that *H. influenzae* is a major cause of bacterial meningitis and/or pneumonia in the Philippines, India, Thailand, Malaysia, Indonesia and Vietnam. Singapore and Hong Kong have a low incidence of infection compared with Western and other Asian nations (Lolekha *et al*, 2000). More than half of all cases of culture-positive childhood bacterial meningitis were caused by *H. influenzae* type b, although successful isolation of a pathogen occurred in only a small proportion of cases. For this reason the true incidence of *H. influenzae* meningitis cases in Malaysia remains unknown. These findings are consistent with previous studies in Malaysia (Hussain *et al*, 1998).

Lim *et al* (1994) reported that a set of twins born to a 24-year-old primigravida had evidence of sepsis 24 to 60 hours after birth and were treated empirically with penicillin and gentamicin. A non-encapsulated *H. influenzae* biotype IV strain was isolated from the blood cultures of both and from the CSF of Twin 2. The isolates were beta-lactamase positive and showed resistance to ampicillin. Therapy was changed to chloramphenicol only. Twin 2 recovered but Twin 1 developed a brain abscess in the left occipital region which resolved with extended antibiotic treatment. Although ampicillin-resistant *H. influenzae* has been reported in Malaysia, invasive disease by such

strains is rare.

All three major etiological bacteria (*S. pneumoniae*, *H. influenzae*, *E. coli*) were 100% sensitive to ceftriaxone. *S. pneumoniae* was 100% sensitive to penicillin and *H. influenzae* was 90% sensitive to penicillin. Choo *et al* (1990) and Nik Khairuddin *et al* (1999) reported similar findings.

The mainstay of treatment for bacterial meningitis is antibiotic therapy. Empiric therapy, directed at the most common organisms, is given until a microbiologic diagnosis is made. The initiation of antibiotics in a patient suspected to have bacterial meningitis should not be delayed while a diagnosis is made due to the high incidence of complications in untreated patients, such as brain damage, hearing loss, and death.

Early antimicrobial therapy has been shown to reduce adverse outcomes. Clinicians need to be alerted to the presence of the disease in the community and the disease should be made notifiable within 24 hours of detection both for early treatment of cases and to facilitate contact tracing, institution of prophylactic treatment and prevention of secondary cases (Raja *et al*, 2006).

Cephalosporin antibiotics constitute the current standard treatment, although they must be administered in high doses due to their relative inability to cross the blood-brain barrier. Vancomycin is frequently added due to the high incidence of resistance of organisms to cephalosporins, particularly *S. pneumoniae*. When *Listeria* is suspected, ampicillin should be added. If microbiologic testing eventually reveals an etiologic organism, the antibiotic regimen should then be altered to more specifically cover the appropriate bacteria.

Most complications occur in children less than five years old. Eighteen children (69%) had neurological sequelae, such as subdural effusions, cerebral edema, epilepsy and hydrocephalus.

The inclusion of the *H. influenzae* type b vaccine in the routine infant immunization

schedule in many industrialized nations has significantly reduced the incidence of invasive disease. Recent studies have shown *H. influenzae* vaccination is also effective in preventing invasive disease in children in developing countries. While population-based data may be required to confirm the need for public-funded infant *H. influenzae* immunization in Asia, its introduction in countries with a high incidence of *H. influenzae* meningitis and/or pneumonia has the potential to significantly improve pediatric health and survival (Lolekha *et al*, 2000).

In conclusion, it was found that more than half of all cases of bacterial meningitis admitted to UMMC were children less than five years old. The most common microorganisms responsible were *S. pneumoniae*, *H. influenzae* and *E. coli*. Most had neurological sequelae. Prompt treatment is essential whenever presumed cases of meningitis are encountered so that the incidence of bacterial meningitis and its complications can be reduced.

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