Etiology and Outcome of Adult Bacterial Meningitis in Yaoundé, Cameroon

Sinata Koulla-Shiro, MD;* Josephine Mbuagbaw, MD;† Christopher Kuaban, MD;& and Alexandre Kouda Zeh, MD†

ABSTRACT

Objective: To determine the etiology and outcome of adult bacterial meningitis in Yaoundé, Cameroon.

Methods: Adult patients admitted for bacterial meningitis into the Yaoundé Central Hospital between January 1988 and December 1993 were included in a retrospective review. Patient records were examined and information regarding etiology and outcome and relevant clinical and laboratory data were collected.

Results: Seventy patients were included in the study. There were 41 men and 29 women; their ages ranged from 15 to 65 years. Thirty patients had received antibiotic treatment before admission. Bacteriologic analysis of cerebrospinal fluid was performed in 46 patients, and a microbial etiology was established in 24 patients (34.3% of total). Streptococcus pneumoniae and Neisseria meningitidis were the most common organisms. Other isolates included Escherichia coli, Salmonella enteritidis, Listeria monocytogenes, and Mycobacteria species; each of these species caused a single case of meningitis. Thirty patients (42.9%) had a complete clinical recovery, 18 patients (25.7%) developed sequelae, and 19 patients (27.1%) died. Ten patients died within 72 hours of admission. Three patients were taken out of the hospital by their families and were lost to follow-up. An age greater than 50 years was significantly associated with death (P < 0.05). Mortality was not related to etiology, although there was a trend toward increased mortality with pneumococcal meningitis.

Conclusion: The authors recommend that empirical treatment for bacterial meningitis should be given promptly and should cover S. pneumoniae and N. meningitidis, which are the most prevalent causes of bacterial meningitis in the community studied.

Key Words: bacterial meningitis, Cameroon

Bacterial meningitis remains a deadly disease worldwide. Despite the introduction of newer antimicrobial agents and the tremendous knowledge gained about the pathogenesis of this disease, the mortality rate among adults with bacterial meningitis still ranges from 25 to 45%.

Early clinical recognition and prompt antibiotic treatment are the hallmark for survival from meningitis. Empirical antibiotic treatment should be given to limit mortality. The choice of antibiotic depends largely on the local bacterial epidemiology, the antimicrobial susceptibility of these organisms, and the pharmacokinetics of available agents. Most published studies on the bacterial etiology of meningitis, in developing countries, have focused on children. The etiology of adult bacterial meningitis has not been well documented. The objective of this study was to determine the etiology and outcome of adult bacterial meningitis in the local population.

PATIENTS AND METHODS

This study was conducted at the Infectious Disease Service of the Unit of Internal Medicine at Yaoundé Central Hospital. The authors reviewed the clinical records of all consecutive adult patients, aged 15 years and older, who were admitted between January 1988 and December 1993 with bacterial meningitis. The bacterial etiology and outcome were recorded. The diagnosis of bacterial meningitis was based on clinical features such as headache, fever, nuchal rigidity, change in mental status (coma, agitation, restlessness, or delirium) associated with at least two of the following: (1) presence of turbid or purulent cerebrospinal fluid (CSF); (2) elevated CSF protein level over 1 g/L and glucose quotient CSF/blood or hypoglycrrhachia below 0.5 g/L; (3) CSF pleocytosis over 10 elements/μL, with a predominance of polymorphonuclear leukocytes; and (4) presence of bacteria on Gram stain or culture of CSF.

Demographic data, antecedent or predisposing factors, clinical signs and symptoms, laboratory analysis of CSF, blood cultures, antibiotic treatment before and after admission, duration of hospitalization and outcome, were
TABLE 1. Causes of Bacterial Meningitis in 46 Adults

<table>
<thead>
<tr>
<th>Organism</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 46 (%)</td>
</tr>
<tr>
<td><strong>S. pneumoniae</strong></td>
<td>14 (30.4)</td>
</tr>
<tr>
<td><strong>N. meningitidis</strong></td>
<td>6 (13.0)</td>
</tr>
<tr>
<td><strong>E. coli</strong></td>
<td>1 (2.2)</td>
</tr>
<tr>
<td>Salmonella species</td>
<td>1 (2.2)</td>
</tr>
<tr>
<td><strong>L. monocytogenes</strong></td>
<td>1 (2.2)</td>
</tr>
<tr>
<td>Mycobacterium species</td>
<td>1 (2.2)</td>
</tr>
<tr>
<td>Culture negative</td>
<td>22 (47.8)</td>
</tr>
</tbody>
</table>

extracted from the patients' files and were analyzed. Variables were compared by chi-square with significance level at P < 0.05.

RESULTS

Seventy patients were included in the study: 41 men and 29 women, aged 15 to 65 years (mean, 34.3 y). All 70 patients had fever (> 37.5°C) and 23 (32.9%) were in a comatose state on admission. Headache was observed in 40 patients (57.1%), neck stiffness in 46 (65.7%), and vomiting in 14 (20%). Factors predisposing to meningitis were not recorded in the majority of cases. One patient presented with a CSF leak secondary to recent head trauma, one had sinusitis, and four patients had concurrent pneumonia. For 24 of 70 patients, the diagnosis was mainly based on clinical presentation and purulent aspect (macroscopic and microscopic) of CSF. For 46 patients, there was both clinical and CSF cytologic evidence of bacterial meningitis. Bacteriologic analyses of CSF were performed only in these 46 patients (65.7%). In 24 of them (52.2% of the subgroup), an etiologic agent was identified by culture. Blood cultures were performed in four patients, and only one was positive.

The organisms recovered in CSF cultures are listed in Table 1. Streptococcus pneumoniae was the predominant etiologic agent and was responsible for meningitis in 14 of 46 (30.4%) patients who had CSF cultures. Neisseria meningitidis was responsible for six (13%) cases, and Escherichia coli, Salmonella enteritidis, Listeria monocytogenes and Mycobacterium species caused meningitis in one case each (2.2%).

Antibiotic susceptibility studies were rarely performed because of costs. Thirty patients had received at least one dose of antibiotics before admission. Empirical antibiotic treatment was given to all 70 patients on admission. It consisted of the combination of penicillin and chloramphenicol (55 patients) or amoxicillin-penicillin alone (10 patients) or combined with chloramphenicol (5 patients). Parenteral therapy was continued, when possible for 10 to 14 days. Chloramphenicol was discontinued if cultures yielded pneumococcus or meningococcus. The patient with mycobacterial meningitis was switched to triple oral antituberculosis therapy (isoniazid, rifampin, and pyrazinamide); pyrazinamide was continued for 2 months and the other agents for 6 months.

Table 2 shows the bacterial etiology and outcome of 70 patients with purulent meningitis. Thirty of 70 patients (42.9%) experienced complete clinical recovery, 18 patients (25.7%) developed sequelae, and 19 patients (27.1%) died during hospitalization. Ten of 19 patients died within 72 hours of admission. Another three patients were taken out of the hospital by their families while in a comatose state and were lost to follow-up. Hearing impairment, confirmed by audiologic testing, and cranial nerve palsies were the most common sequelae; they were observed in ten and seven patients, respectively. The cause of meningitis was S. pneumoniae in four of ten patients with hearing impairment, one of whom also had paralysis of the sixth cranial nerve. Neisseria meningitidis was responsible for cranial nerve palsy in two patients. The patient with tuberculous meningitis presented with ataxia and hearing loss, and the patient with listeria meningitis had speech disturbance. In 10 of 18 patients with sequelae, no causative organism was found. Hearing impairment (n = 5), cranial nerve palsy (n = 3, associated with right hemiparesis in 1 case), cerebral abscess (n = 1), and hospital-acquired urinary tract infection due to Enterobacter aerogenes (n = 1) were among the complications observed in these patients.

An age over 50 years was associated with a significantly higher mortality rate. The mortality rate was 17.5%
Discussions

This study identified the causative organisms of adult bacterial meningitis in Yaoundé Central Hospital, and it assessed outcomes of patients. However, etiologic agents of bacterial meningitis were determined in only 24 (34.3%) of 70 patients due to the inability of many of the patients to pay for laboratory tests and also because some had received prior antibiotic treatment. Indeed, 30 (42.9%) patients had received at least one dose of antibiotic before admission.

Streptococcus pneumoniae and N. meningitidis were the most common organisms, accounting for 58.3% and 25% of known etiologies, respectively. This finding agrees with that of other authors.1-3 Gram-negative bacilli other than Haemophilus influenzae were recovered in two cases of meningitis, both of which were hospital acquired. Recurrent pneumococcal meningitis was observed in a patient with a history of head injury and CSF leak, and three patients with pneumococcal meningitis had concurrent pneumonia. This finding is classic. The fourth patient with pneumonia had pulmonary tuberculosis and tuberculous meningitis.

Hearing impairment and cranial nerve palsies were the most frequent complications in this study. Patients with pneumococcal meningitis were more prone to such complications. Hearing impairment has been documented in human and experimental bacterial meningitis,1,4 and different etiologies, including H. influenzae have been incriminated as highly associated with deafness, particularly in children.7 Recently Dodge et al., in a prospective study, showed that deafness, which is a frequent complication of bacterial meningitis, is more likely to follow pneumococcal meningitis.4

The overall mortality rate in this study (27.1%) was lower than that of similar studies in other developing countries.3 High risk factors of death were an age over 50 years (P < 0.01) and, probably, an infection with S. pneumoniae. This finding stresses the virulence of this organism and the need for its rapid treatment and its prevention in patients at risk of acquiring invasive pneumococcal disease.

No difference in outcome was observed between the group of patients whose CSF yielded an etiologic agent and the two groups with unknown etiology (culture negative CSF and unanalyzed CSF groups). Thus, it is probable that these two categories of patients shared the same kinds of etiologic factors.

Although the laboratory of Yaoundé Central Hospital has the ability to perform microbiologic and biochemical analyses of CSF, the tests were not done, in many cases, because patients were unable to afford these services. Thus, the diagnosis of septic meningitis remained based on clinical symptoms and signs and the finding of turbid CSF.

The dependence on clinical signs and symptoms for diagnosis makes it critical to institute prompt empirical antibiotic treatment. The empirical regimen must cover S. pneumoniae and N. meningitidis, the most prevalent species, whenever clinical findings and macroscopic examination of the CSF are suggestive of bacterial meningitis. Penicillin remains the mainstay of treatment in developing countries. Because of the increasing incidence of pneumococci resistant to penicillin worldwide, susceptibility studies of S. pneumoniae to penicillin are urgently needed in Cameroon to guide the appropriate choice of empirical antibiotic therapy in bacterial meningitis.

References