Bacteriological Profile of Pyogenic Meningitis in Adults

A Sonavane, VP Baradkar, M Mathur

Abstract
Acute bacterial meningitis remains a major cause of mortality and long term neurological sequelae worldwide. There is a need for periodic review of bacterial meningitis worldwide, since the pathogens responsible for infection vary with time, geography and patient's age. A retrospective analysis of 7759 clinically suspected cases of meningitis, admitted during a span of 3 years from February 2005 to February 2008 was undertaken. 4750 were males and 3509 were females. Total 43 bacteria were isolated from 7759 cases with isolation rate of 0.55%. *Pseudomonas aeruginosa* was the commonest isolate 23.25% (10/43) followed by *Klebsiella pneumoniae* 20.93% (9/43), *Acinetobacter* spp. 20.93% (9/43), *Streptococcus pneumoniae* 18.60% (8/43), while other isolates were *Neisseria meningitidis* 4.65% (2/43), *Streptococcus pyogenes* 4.65% (2/43), *Enterococcus* spp. 2.23% (1/43) and other *Streptococcus* spp. 2.23% (1/43). Antibiotic susceptibility pattern showed that out of 10 strains of *Pseudomonas aeruginosa* isolated maximum 70% (7/10) were sensitive to Piperacillin, 60% (6/10) to Chloramphenicol and Netilmicin each, 50% (5/10) to Piperacillin-Tazobactam combination, while 40% (4/10) were sensitive to ceftazidime. *Klebsiella pneumoniae* showed maximum sensitivity to Netilmicin 66% (6/9) followed by Chloramphenicol, Amikacin and Ciprofloxacin 44% (4/9 each). *Acinetobacter* spp. showed maximum sensitivity to Netilmicin 50% (5/10) followed by Ciprofloxacin 30% (3/10). Amongst Gram positive isolates *Streptococcus pneumoniae*, *Streptococcus pyogenes* and *Enterococcus* spp. were 100% sensitive to almost all the antibiotics tested, except *Streptococcus* spp. which was sensitive only to Amikacin and Vancomycin (Table 1). In conclusion, judicious use of antibiotics will prevent the emergence of drug resistance among Gram negative bacilli, so that morbidity and mortality can be reduced.

Introduction
Acute bacterial meningitis remains a major cause of mortality and long term neurological sequelae worldwide. Despite of availability of potent antibiotics the mortality rate due to acute bacterial meningitis remains significantly high in India and other developing countries.¹-⁴ There is a need for periodic review of bacterial meningitis worldwide, since the pathogens responsible for infection vary with time, geography and patient’s age.² Increase in awareness, availability of vaccines may also reflect a change in the epidemiological pattern of these pathogens. The aetiological agents of community acquired meningitis may differ from hospital acquired meningitis. Delay in diagnosis and initiation of treatment can result in poor outcome of the disease.⁵ Since clinical signs and symptoms can’t be always relied upon,⁴ laboratory support is imperative to achieve early diagnostics. As a result of emergence of antimicrobial resistance being reported, recommendations for therapy are changing. Laboratory surveillance of isolates is crucial to identify targets for formation of rational empirical treatment for potentially fatal bacterial meningitis.

We reviewed the microbiological records
of patients with bacterial meningitis to
determine frequency of pathogens causing
acute bacterial meningitis, to find out
aetiological agents and their susceptibility
pattern.

Material and Methods

A retrospective analysis of 7759 clinically
suspected cases of meningitis, admitted
during a span of 3 years from February 2005
to February 2008 was undertaken. Our
Lokmanya Tilak Municipal Medical college
is a tertiary care centre, which is 1500 bedded
and situated in the heart of city. All the
clinically suspected cases are included in this
study. Cases of post-traumatic meningitis and
meningitis developing after cranial surgery
were excluded. CSF sample was collected
aseptically in a sterile test tube and were
processed immediately. The macroscopic
appearance of CSF was recorded. Routine CSF
counts were recorded, wet mount was
prepared to find out presence or absence of
pus cells, Gram’s staining was done to find
out pus cells and organisms, ZN staining to
find out acid fast bacilli (AFB). Negative
staining was done with Nigrosin to rule out
Cryptococcal meningitis. All the samples were
incubated in glucose broth, which acted as a
back up from which subcultures were done
on Blood agar, Chocolate agar and MacConkey
agar. All the culture plates were incubated
at 37°C in incubator for 24-48 hours in
presence of 5-10% CO₂ using candle jar and
60-70% humidity. The culture plates were
observed daily for presence of growth. When
growth appeared, secondary smear from
colony was performed to find out whether the
growth is of Gram positive or Gram negative
organisms.

The isolates were identified by standard
techniques and their antibiotic susceptibility
was done by Kirby-Bauer disc diffusion
technique.

Results

Out of 7759 suspected cases of bacterial
meningitis, 4750 were males and 3509 were
females (Male: Female ratio 1:35). All the
patients were adults. Total 43 bacteria were
isolated from 7759 cases with isolation rate
of 0.55%. The correlation between Gram’s
staining and culture was 100%.

Pseudomonas aeruginosa was the
commonest isolate 23.25% (10/43) followed by
Klebsiella pneumoniae 20.93% (9/43),
Acinetobacter spp. 20.93% (9/43),
Streptococcus pneumoniae 18.60% (8/43),
while other isolates were Neisseria
meningitidis 4.65% (2/43), Streptococcus
pyogenes 4.65% (2/43), Enterococcus spp.
2.23% (1/43) and other Streptococcus spp.
2.23% (1/43). A predominance of
polymorphonuclear cells was seen in all the
samples which grew bacteria, the protein
counts were raised and sugar counts were
decreased.

Antibiotic susceptibility pattern showed
that out of 10 strains of Pseudomonas
aeruginosa isolated maximum 70% (7/10) were
sensitive to Piperacillin, 60% (6/10) to
Chloramphenicol and Netilmicin each, 50%
(5/10) to Piperacillin- Tazobactam
combination, while 40% (4/10) were sensitive
to ceftazidime. Klebsiella pneumoniae showed
maximum sensitivity to Netilmicin 66% (6/9)
followed by Chloramphenicol, Amikacin and
Ciprofloxacin 44% (4/9 each). Acinetobacter
spp. showed maximum sensitivity to Netilmicin 50%
(5/10) followed by Ciprofloxacin 30% (3/10). Amongst Gram
positive isolates Streptococcus pneumoniae,
Streptococcus pyogenes and Enterococcus spp.
were 100% sensitive to almost all the
antibiotics tested, except Streptococcus spp.
which was sensitive only to Amikacin and
Acute bacterial meningitis is a medical emergency, which warrants early diagnosis and aggressive therapy. Most of therapy for bacterial meningitis has to be initiated before the aetiology is known. The choice of initial antibiotics therapy is based on the most common pathogens prevalent in geographical area, age group and antibiotic susceptibility pattern.

The isolation rate was very low 0.55% (39/7759). Several studies report low CSF culture positivity ranging from 6-50%. The low isolation rate may be due to partially treated cases, delay in transport as reported earlier.

Though common pathogens isolated were *Pseudomonas aeruginosa*, *Acinetobacter spp.*, *Klebsiella pneumoniae*, *Streptococcus pneumoniae*, *Escherichia coli* and *Enterobacter spp.*, their relative frequency vary in different geographical area. As compared to western studies, the relative incidence of meningitis caused by *Haemophilus influenzae*, *Neisseria meningitidis* and *Listeria spp.* is less in South East Asia. On the contrary Gram negative bacilli such as *K. pneumoniae*, *Pseudomonas aeruginosa*, *Acinetobacter spp.* are increasingly being recognized as important pathogens. These Gram negative isolates are also reported as pathogens of bacterial meningitis in a recent study conducted at NIMHANS Bangalore in 2006.

Among Gram positive bacteria isolated in the present study commonest was *Streptococcus pneumoniae* 18.60% (8/39) followed by *Streptococcus pyogenes* (2), *Enterococcus spp.* (1) and other *Streptococcus spp.* (1).

### Table 1: Shows the antibiotic susceptibility pattern of the isolates to various antibiotic discs used

<table>
<thead>
<tr>
<th></th>
<th>PT</th>
<th>Pc</th>
<th>Zn</th>
<th>Nt</th>
<th>Ch</th>
<th>Ca</th>
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<th>Cu</th>
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<tbody>
<tr>
<td><em>Pseudomonas aeruginosa</em> (10)</td>
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<td>2</td>
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<tr>
<td><em>Kl. Pneumoniae</em> (9)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>6</td>
<td>4</td>
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<td>4</td>
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<tr>
<td><em>Acinetobacter spp.</em> (10)</td>
<td>NA</td>
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<td>5</td>
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<tr>
<td><em>E.coli</em> (5)</td>
<td>NA</td>
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<tr>
<td><em>Enterobacter spp.</em> (5)</td>
<td>NA</td>
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<td>NA</td>
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<td>4</td>
<td>NA</td>
<td>3</td>
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<tr>
<td><em>N.meningitidis</em> (2)</td>
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<td><em>Str.pneumoniae</em> (8)</td>
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<td><em>Str.pyogenes</em> (2)</td>
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<tr>
<td><em>Str.spp</em> (1)</td>
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<tr>
<td><em>Enterococcus spp.</em> (1)</td>
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</table>

PT- Piperacillin-Tazobactam, Pc- Piperacillin, Zn- Ofloxacin, Ch- Chloramphenicol, Ca- Ceftazidime, Ak- Amikacin, CF- Cefotaxime, Cf- Ciprofloxacin, Cu- Cefuroxime, CP- Cefoperazone, Ag- Augmentin, I- Imipenem, PG- Penicillin, Va- Vancomycin, NT- Netilmicin, NA- Not applicable.

Vancomycin (Table 1).

**Discussion**

Acute bacterial meningitis is a medical emergency, which warrants early diagnosis and aggressive therapy. Most of therapy for bacterial meningitis has to be initiated before the aetiology is known. The choice of initial antibiotics therapy is based on the most common pathogens prevalent in geographical area, age group and antibiotic susceptibility pattern.

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Only 4 (1%) cases of Meningococcal meningitis were detected in a study carried out over last ten years, all in adult patients. Our finding is comparable with Indian report. In our study N.meningitidis was isolated in 2 cases only showing low isolation rate (4.65%). All the patients responded to treatment.

In conclusion, in recent years Gram negative bacilli are emerging as important pathogens causing acute bacterial meningitis in adults. Judicious use of antibiotics will prevent the emergence of drug resistance among Gram negative bacilli, so that morbidity and mortality can be reduced.

References

Best Wishes
From
A
Well Wisher