A Prospective Study of Acute Suppurative Otitis Media in Infancy. Bacteriology and Antibiotic Treatment

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Abstract
Ear swabs were collected from 120 children with acute otitis media during the first year of life. The isolated microorganisms were identified according to the morphology culture characteristic and biochemical tests. Development of resistance of bacteria against more than one antibiotic, penicillins, macrolides and cephalosporin’s is noticed. Amoxicillin, trimethoprim-sulfamethoxazole represent the first line in clinical treatment except for recurrent acute otitis media. In case of children expected to have antimicrobial resistance against the infecting bacteria, treatment is started by amoxicillin–clavulanate, while cefprozil can be used in first line treatment as well. Compliance, following pharmaceutical instructions, the cost of medicines, dealing with the management policy from the parents side, treatment by azithromycin, clarithromycin. cefixime and ceftriaxone may be useful in patients who are suffering from mal–absorption and complicated cases like meningitis.

Introduction
Acute otitis media (AOM) is an inflammation of the middle ear which was a worldwide problem and associated with serious effects especially among infants and young children, in spite of advanced technique in pharmacy and antibiotic (1,2). In most new studies, it is recorded that the disease influences both sexes at different ages and the higher incidences is during the first year of age (3).60%
exposed (at least) for one infection and a majority of recurrence 75% at the age of three years. (4). The incidence of AOM recorded a general decline with the advancement of age (5). It occurs frequently in the winter months and the influence of the predisposition on AOM and the incidence of viral respiratory infection fluctuates during the year seasons (6,7). Based on that, this study was designed to shed some light on the most efficacious choice for treatment of patients against bacteria in vivo as well as in vitro with explaining the resistance of causative bacteria, which causes, AOM against antimicrobial agents.

Patients and Methods

The study was carried out on 120 consecutive outpatients with AOM during the period from December 2007 to May 2008 at ENT department in Al- Sadder Teaching Hospital and Al-Zahra Teaching Hospital in Al-Najaf province. All children with discharging ear during the first year of life had been involved in this study from both sexes and all of them submitted to ENT examination. A swab was taken from each discharging ear for bacteriological study before otoscopic examination or ear toilet to prevent contamination. The ear was cleaned by dry mopping or by using suction machine. A broad spectrum antibiotic was started in addition to local decongestant therapy as nasal drops. As the treatment was started, the parents were taught to clean the ear by mopping by clean cotton wool and instructed to come back after 2-3 days when the results of bacteriology were ready.

Treatment of specimens

A swab (with pus from ear) was inoculated onto blood agar, chocolate agar and MacConkey agar and incubated at 37 °C for 24-48 hrs. The recovered bacterial isolates were identified to the level of species by using conventional biochemical tests (8).

The following antibiotics (AB) were studied: amoxicillin, trimethoprim-sulamethoxazole, amoxicillin-clavulanate, ceftriaxone, clarithromycin, azithromycin, cefprozil, and cefixime and were provided by the manufacturer (Himedia). In vitro susceptibility tests were performed by the agar diffusion method according to the recommendation of the NCCLs with Muller-Hinton agar. (9)

Results

Among 120 patients, 86 were found to have bacterial otitis media. The following bacterial isolates were recovered, Streptococcus pneumoniae (29.2%), Staphylococcus aureus (23.3%), and Staphylococcus epidermidis (19.2%) (Table-1).

Table 1: The number and percentage of bacteria isolated from patients infected with AOM

<table>
<thead>
<tr>
<th>Types of bacteria</th>
<th>No.(%) of isolations</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. pneumoniae</td>
<td>35 (29.2)</td>
</tr>
<tr>
<td>S. aureus</td>
<td>28 (23.3)</td>
</tr>
<tr>
<td>S. epidermidis</td>
<td>23 (19.2)</td>
</tr>
<tr>
<td>No growth</td>
<td>34 (28.3)</td>
</tr>
<tr>
<td>Total</td>
<td>120 (100)</td>
</tr>
</tbody>
</table>

Eighty-six bacterial isolates from ear specimens were tested firstly with routine antibiotic susceptibility test (Table 2).
Table 2: Antibiotic resistances of bacteria isolated from patients infected with AOM (in vitro).

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>S.pneumoniae n=35</th>
<th>S. aureus n=28</th>
<th>S.epidermidis n=23</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMX</td>
<td>*15</td>
<td>25</td>
<td>53</td>
</tr>
<tr>
<td>AMX-CL</td>
<td>19</td>
<td>30</td>
<td>55</td>
</tr>
<tr>
<td>CLM</td>
<td>15</td>
<td>26</td>
<td>15</td>
</tr>
<tr>
<td>TMP-SMX</td>
<td>38.6</td>
<td>35</td>
<td>50</td>
</tr>
<tr>
<td>AZM</td>
<td>15</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>CEF</td>
<td>20</td>
<td>30</td>
<td>55</td>
</tr>
<tr>
<td>CFX</td>
<td>30</td>
<td>90</td>
<td>80</td>
</tr>
<tr>
<td>LOP</td>
<td>18</td>
<td>60</td>
<td>85</td>
</tr>
<tr>
<td>CPZ</td>
<td>10</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>CTX</td>
<td>25</td>
<td>16</td>
<td>30</td>
</tr>
</tbody>
</table>

* = Resistance percentage

All the 86 patients treated by antibiotics which were determined by antibiotic sensitivity test and follow up. Some cases were suffering from diarrhea, urticaria due to side effect of antibiotic on digestive system especially intestine (Table 3).

Table (3): Antibiotics used in AOM treatment in vivo.

<table>
<thead>
<tr>
<th>Regimen</th>
<th>NO. of patients (%)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMX-cl II (40 mg /kg/day)</td>
<td>9(78.5)</td>
<td>26% diarrhea for 3 days</td>
</tr>
<tr>
<td>AZM (10 mg/kg/day ) IIIc</td>
<td>8(93)</td>
<td>3% diarrhea</td>
</tr>
<tr>
<td>AMX 30 mg /kg /day )II</td>
<td>6(94)</td>
<td>1.7% urticaria</td>
</tr>
<tr>
<td>CTX (50mg/kg/day ) I / M</td>
<td>7(15)</td>
<td>10.2% patient suffering from urticaria</td>
</tr>
<tr>
<td>CLM (15mg/kg/day)Ib</td>
<td>14(93)</td>
<td>Failed follow up</td>
</tr>
<tr>
<td>CEF (40mg/kg/day)II</td>
<td>6 (68)</td>
<td>Failed follow up</td>
</tr>
<tr>
<td>CPZ(40mg/kg/day) I</td>
<td>12(84)</td>
<td>Failed follow up</td>
</tr>
<tr>
<td>LOP (30 mg/kg/day) I</td>
<td>6(91)</td>
<td>1.1% from diarrhea</td>
</tr>
<tr>
<td>CFX(8 mg/kg/day) I a</td>
<td>8(90)</td>
<td>Failed follow up</td>
</tr>
<tr>
<td>TMP-SMX(8mg/kg/day)I</td>
<td>10(82)</td>
<td>Failed follow up</td>
</tr>
</tbody>
</table>

Total 86
a= duration of treatment 8 days , b= duration of treatment 7-10 days 
c= duration of treatment 3 days ,I = treatment twice /day 
II = treatment 3 times /day ,III= treatment 4 times /day,Amoxicillin =AMX , 
Amoxicillin –clavualnate =AMX-Cl 
AZM= azithromycin ,CAE=cefuroxime ,CEF= ceafactor , CFX= cefixime 
CLM=Clarithromycin ,CPZ=cefprozil ,CTX=cefiriaxone , LOP=Loracarbef 
TMP-SMX=trimethoprim- sulfamethoxazole

Discussion

In clinical practice the activity of antibiotics in treated AOM usually depends on 
the disappearance of clinical signs .Thus clinical response may never be considered as 
bacterial response .Clinical success can be defined as disappearance of fever and 
inflammation the in ear after 3 days of treatment . Failure of treatment can be defined 
as presence of pathogenic bacteria after 3 days of treatment or presence of other 
pathogenic bacteria (10).

Other factors that influence successful treatment include: 
Removal of the discharge from the middle ear .
Degree of the inflammation.
Blood vessel permeability in mucous membrane of the middle ear. 
Antimicrobial resistance against causative organism.
Demonstrated antibiotic depend on causative bacteria, bacterial sensivity , patient’s 
compliance for the drug and the age of the patient .
The second line antibiotic treatment for patients not responding to the first line 
antibiotic are clarithromycin, cefuroximeaxetil while ceftriaxone was used in patient 
who were suffering from mal-absorption.
Krause et al (11) found that high blood concentration of the antibiotic that reaches the 
middle ear is about 14% in case of amoxicillin , 23% cafacter , 27% trimethoprim- 
sulfamethoxazole.Pneumococci strains’ resistance which are not β-lactamase producing 
(enzyme responsible for analysis or brake of β-lactame in penicillin and 
cephalosporin's) resistance is conducted through PBPs of the bacteria that inhibit 
penicillins .(12)
Cefixime activity against S. pneumoniae recorded by few moderate effects , therefore, 
it is not included in the first line treatment and spared to the second line 
treatment.Amoxicillin and most oral cephalosporin's generations may cause 
hypersensivity reactions and digestive symptoms which were considered as unfavorable 
side effect .Cefaclor was concerned with serum sickness-like illness .
Strains sensitive to penicillin are also sensitive to oral cephalosporins therefore , 
cephalosporins are not useful against resistance strains except for ceprozil , cefuroxime 
which have maximum inhibitory concentration (MIC) of 5 times less than (MIC) of 
amoxicillin and amoxicillin–clavulanate .(13)
In conclusion these observations indicate that resistance of bacteria toward antibiotics 
is due to easy availability of antibiotics in pharmacies randomly without prescription ( 
not based on culture and sensitivity) . Now, after development of this resistance we 
should use amoxicillin as the first line of treatment while second line should only be 
used after failure of the first line treatment.
Amoxicillin ,trimethoprim-sulfamethoxazole are better because both of them are cost 
effective in comparison to oral cephalosporines. Vancomycin and rifampin may be 
added (14).
In this study, some of isolated bacteria recorded sensitivity to the determined antibiotic in vitro without remarkable effect in vivo. These results may be attributed to MIC of antibiotic to inhibit bacterial growth, therefore the treatment fails (12).

We recommend, culture and sensitivity to identify the causative bacteria before prescribing antimicrobial therapy to avoid multi-drug resistance in AOM.

References