



Acute Otitis Media

Introduction & Epidemiology

Acute otitis media (AOM) is the acute inflammation of the middle ear, which is the space containing three ossicles between the tympanic membrane and the inner ear. It is a common paediatric condition with prevalence peaked at 6-18 months. It is reported that 27% of infants and 37% of children with upper respiratory tract infection develop AOM. (1, 2)

Aetiology

Worldwide, the average predominance of causative bacterial pathogens of AOM are as follows: *Streptococcus pneumoniae* (28%), *Haemophilus influenzae* (nontypeable) (23%) and *Moraxella catarrhalis* (7%). (3) The remaining cases are caused by other bacteria e.g. Group A Streptococcus. Usually there is a single bacterial cause but coinfection with other pathogens can occur. (4) Viruses of upper respiratory tract infection e.g. respiratory syncytial virus, adenovirus and influenza viruses can be found in up to two-thirds of cases. (5) Overseas data has shown that the incidence of AOM has decreased after large-scale implementation of childhood pneumococcal vaccination, although the situation of serotype replacement requires further monitoring. (6, 7)

Clinical features

Typical symptoms of AOM include otalgia that interferes with normal activity or sleep, new onset ear discharge, fever and irritability in infant. Otoloscopic examination may show acute inflammation of the tympanic membrane with signs of middle ear effusion, such as bulging tympanic membrane or air-fluid level in the middle ear. The tympanic membrane may appear to be yellow, erythematous or hemorrhagic. (8, 9, 10) AOM may rarely cause complications including intratemporal (e.g. hearing loss, perforation of ear drum, mastoiditis) and intracranial (e.g. meningitis, brain abscess, venous sinus thrombosis). The annual incidence rate of complications is very low in developed countries (e.g. 0.32/100 000 in Finland), (11) whereas the rate is higher in developing countries (e.g. 0.8% in Brazil). (12, 13)

Diagnosis

Clinicians should diagnose AOM in children who present with moderate to severe bulging of the tympanic membrane or new onset of otorrhoea not due to acute otitis externa. Alternatively, AOM should be diagnosed in children who present with mild bulging of the tympanic membrane and recent onset (less than 48 hours) of ear pain (holding, tugging, rubbing of the ear in a nonverbal child) or intense erythema of the tympanic membrane. Other features supporting a bacterial cause would be purulent otorrhoea, a yellow tympanic membrane and bilateral ear involvement. (4, 8, 9)

Accurate diagnosis of AOM is important because using antimicrobial to treat viral AOM or otitis media with effusion (OME) in the absence of inflammation is unnecessary and could lead to potentially harmful side effects as well as contribute to antimicrobial resistance. (4)

If middle ear effusion is suspected but is not evident on otoscopy, pneumatic otoscopy, tympanometry, or both may be used. Pneumatic otoscopy is a useful technique for the diagnosis of AOM and OME and is 70% to 90% sensitive and specific for determining the presence of middle ear effusion. (9) Use an otoscope with a bright light source e.g. replacing the bulb yearly, and the largest ear speculum that fits into a child's ear to facilitate visualization. (4) In cases with ear discharge, swabs may be taken and sent for microscopy, culture and susceptibility testing in order to identify pathogens from middle and outer ear. (14)



Management

Table 1. Indications of antibiotic prescription and suggested duration of therapy for Acute Otitis Media in children

Age and Clinical Characteristics	Recommended treatment approach
Children 6 months or older with otorrhoea or severe signs or symptoms (moderate or severe otalgia, otalgia for at least 48 hours, or temperature of 102.2°F [39°C] or higher)	Antibiotic therapy for 10 days
Children 6 to 23 months of age with bilateral acute otitis media without severe signs or symptoms	Antibiotic therapy for 10 days
Children 6 to 23 months of age with unilateral acute otitis media without severe signs or symptoms	Observation or antibiotic therapy for 10 days
Children 2 years or older without severe signs or symptoms	Observation or antibiotic therapy for 5-7 days

Antibiotics should always be prescribed for children less than 6 months of age with suspected or confirmed AOM. For children older than 6 months, the decision to prescribe antibiotics would depend on clinical characteristics. (Table 1) Routine prescription of antibiotics for AOM in children with low severity appears to be unwarranted. According to a recent Cochrane review, antibiotic treatment leads to no or only slight effect on pain, a modest effect on the number of tympanic perforations, contralateral otitis episodes and abnormal tympanometry findings at the following weeks, with no difference in the rare occurrence of severe complications. Antibiotics are most useful in children under two years of age with bilateral AOM, or with both AOM and otorrhoea. (15) High fever ($\geq 39^{\circ}\text{C}$), severe otalgia and a moderate to severe systemic illness would also benefit from antibiotic treatment. For all cases, if symptoms are persistent after 48 to 72 hours of observation, reassess for the presence of otitis media and consider initiation of antibiotics. For those not responding to initial antibiotic therapy, consider to change antibiotics or refer to specialists. (4, 8, 9, 10) Tables 2&3 describe the recommended choices of antibiotics for cases requiring such treatment.

Observation without antibiotics may be a feasible option for less severe cases in older infants and children: a Cochrane review found that for patients with respiratory infections where clinicians feel it is safe not to prescribe antibiotics immediately, the approach of no antibiotics prescription but with the advice to return if symptoms do not resolve was able to result in the least amount of antibiotics used, while maintaining similar patient satisfaction and clinical outcomes to delayed antibiotics. (16) Delayed ('backup') antibiotics prescription may also be less suitable in the local settings where medical care is easily within reach of patients.

Table 2. Antibiotics recommendation for initial (first 48 to 72 hours) treatment of Acute Otitis Media in children# (8, 9, 10)

Severe illness e.g. fever $\geq 39^{\circ}\text{C}$, severe otalgia	Antibiotics recommended	Alternative antibiotics for penicillin allergy
No	Amoxicillin* 80-90mg/kg per day in divided doses every 8 or 12 hours (maximum: 3000mg per day)	Non-type 1: Cefuroxime: 15 mg/kg/dose (maximum: 250 mg/dose) every 12 hours for infants > 3 months of age & Children <40kg; Cefpodoxime: 5 mg/kg/dose (maximum: 200 mg/dose) every 12 hours for Infants ≥ 2 months to Children <12 years of age Type 1 (rare): Macrolide e.g. Azithromycin, Clarithromycin**



Yes	Amoxicillin-clavulanate [^] (400mg/57mg per 5ml): 25 mg/3.6 mg/kg/day to 45 mg/6.4 mg/kg/day in divided doses every 12 hours; up to 70 mg/10 mg/kg/day in divided doses every 12 hours ^{^^}	Non-type 1: Ceftriaxone , 50 to 100 mg/kg/ day IV or IM in 1 to 2 divided doses every 12 or 24 hours (max 4000mg per day). Daily doses greater than 2g are divided into 2 doses.
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Table 3. Antibiotics recommendation for failed initial treatment of Acute Otitis Media in children#

Severe illness e.g. fever $\geq 39^{\circ}\text{C}$, severe otalgia	Antibiotics recommended	Alternative antibiotics for penicillin allergy
No	Amoxicillin-clavulanate [^] (400mg/57mg per 5ml): 25 mg/3.6 mg/kg/day to 45 mg/6.4 mg/kg/day in divided doses every 12 hours; up to 70 mg/10 mg/kg/day in divided doses every 12 hours ^{^^}	Non-type 1: Ceftriaxone , 3 days; type 1 (rare): Clindamycin [@]
Yes	Ceftriaxone , 3 days	Referral to specialist [†]

*In Hong Kong, most of the *S. pneumoniae* isolates are susceptible to amoxicillin. Among 775 invasive pneumococcal isolates from various age groups from 2012 to 2016, 94.7%-98.6% have penicillin MIC $\leq 2\text{mg/L}$. (17) Amoxicillin covers *S. pneumoniae* and Group A Streptococcus, but may not cover *H. influenzae* and *M. catarrhalis* due to possible beta-lactamases production. However, the latter two organisms tend to resolve spontaneously more easily. (4)

**Dosages of suggested macrolides are:

Azithromycin: For children <15 kg (<3 years): 10 mg/kg once daily; For children ≥ 15 kg: 15-25 kg (3-7 years): 200 mg once daily; 26-35 kg (8-11 years): 300 mg once daily; 36-45 kg (12-14 years): 400 mg once daily; Over 45 kg: Dose as per adults

Clarithromycin: For children 6 months to 12 years of age: 7.5 mg/kg every 12 hours (maximum: 500 mg/dose).

[^]Amoxicillin-clavulanate is also indicated if 1) amoxicillin has been used in recent 30 days 2) purulent conjunctivitis is present as *H. influenzae* and *M. catarrhalis* are expected (cefuroxime is an alternative).

^{^^}No clinical data are available for doses higher than 45 mg/6.4 mg per kg per day in children under 2 years and for all doses in infants under 2 months of age. Dosing recommendations cannot be made in these situations.

[@]Dosage of clindamycin in children is: 30 to 40 mg/kg/day in divided doses every 6 to 8 hours. Only capsule (not syrup) preparation is available locally. The capsule is dosed as 150mg each.

[#]The route of administration for all antibiotics recommended are oral except for Ceftriaxone which is administered parenterally.

[†]Refer to otolaryngologist for tympanocentesis/drainage. If the tympanocentesis reveals multidrug-resistant bacteria, consultation of clinical microbiologist or infectious diseases specialist for advice is recommended.

Adjunctive treatment & follow-up

Analgesic (e.g. paracetamol, ibuprofen) can relieve pain associated with AOM and should be used regardless of whether antibiotic is prescribed or not. (8) The usual natural history of illness for AOM is 4 days. (18) Upon effective treatment, clinical improvement is expected in 24 hours and symptoms should resolve within 48-72 hours. Some authorities advise another follow up in 2 weeks if unable to visualise tympanic membrane or discharge is present. Referral to specialist should be considered when response to



treatment is poor, suspected complications, recurrent AOM (3 episodes in 6 months) or persistent effusion that may require ventilation tube insertion. (14)

Prevention

Parents/Carers should be given advice about otitis media prevention: avoid tobacco smoking, encourage breast feeding, bottle-feed child in a more upright position, teach child to blow his nose to get rid of mucus. (14) Clinicians should recommend pneumococcal vaccination and seasonal influenza vaccination as indicated. (19, 20) Antibiotic prophylaxis is generally not recommended for the prevention of AOM. (8)

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Disclaimer:

This guidance notes is intended for medical professionals for reference only and is not intended to be prescriptive or a substitute for clinical judgement on management of individual patient. It is not a complete authoritative diagnostic or treatment guide. Medical professionals are recommended to obtain relevant information from other sources, and provide patient management based on clinical judgement. This guidance notes will be updated thereafter. Please visit the website of Centre for Health Protection, Department of Health for the latest update and other information. The Department of Health gratefully acknowledges the invaluable support and contribution of the Advisory Group on Antibiotic Stewardship in Primary Care in the development of this guidance notes.

Version: December 2018