

Otitis Media (Middle Ear Infection) in Children — Causes and Treatment

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Acute otitis media in children is very common with an estimated incidence of 85% within the first year of life. Children usually present with fever, ear fullness, ear discharge, and conductive hearing loss. The most common etiologies of acute otitis media in children are *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*. The diagnosis is based on clinical examination and pneumatic otoscopy findings. Symptomatic treatment is indicated in children and antibiotic therapy should be reserved for those who do not show any clinical improvement within three days after the onset of the disease. Amoxicillin is the antibiotic of choice for acute otitis media in children.



Overview

Acute otitis media is an **inflammation of the middle ear** that is usually caused by a **bacterial infection** and is typically seen in children younger than 5 years.

It is characterized by the presence of **ear pain** which can be associated with **conductive hearing loss** due to the presence of **middle ear effusion**. While middle ear effusions are usually caused by viral etiologies in children, typical acute otitis media is more

commonly caused by bacterial pathogens.

Epidemiology of Acute Otitis Media in Children

Acute otitis media is considerably **more common in children** compared to adults. Up to 15% of pediatrics' consultations are related to acute otitis media.

The estimated incidence of acute otitis media in infants younger than one year is around 85%. The incidence of acute otitis media decreases significantly after 5 years of age.

The peak incidence of acute otitis media has been reported to be in children aged between 3 and 18 months. Boys are slightly more likely to develop acute otitis media compared to girls. African American children have a lower incidence of acute otitis media compared to white children, while native Americans have the highest incidence.

The prognosis of acute otitis media in children after adequate **antibiotic therapy** is excellent. Hearing loss is usually reversible and most children show significant symptomatic treatment within 48 hours of the initiation of antibiotic therapy.

Pathophysiology of Acute Otitis Media

Viral etiologies of acute otitis media include the **respiratory syncytial virus** and **influenza and parainfluenza viruses**. Viral agents are responsible for around one-third of the cases of acute otitis media in children, and the remainder is caused by bacterial pathogens.

The most common bacterial pathogens identified as likely causes of acute otitis media in children are **Streptococcus pneumoniae, Haemophilus influenzae, and Moraxella catarrhalis**. The percentage of cases of acute otitis media caused by each of these bacterial pathogens is the same in children younger than 5 years of age.

The most important pathologic change that is believed to trigger bacterial growth and the development of acute otitis media is the **obstruction of the eustachian tube**. Furthermore, the most common cause of the obstruction of the eustachian tube in children is a **viral upper respiratory tract infection**.

Inflammation of the eustachian tube is responsible for creating **stasis** and elevating the pressure within the middle ear. Stasis also puts the child at an increased risk of **bacterial colonization of the middle ear**.

The previously-mentioned bacterial pathogens are usually unable to adhere to the mucus lining of the middle ear and are unable to cause inflammation on their own. Therefore, an ongoing viral infection is needed to make it easier for these bacterial pathogens to adhere to the mucous linings, resulting in **impaired mucosal linings** of the upper respiratory tract, middle ear, and the eustachian tube.

Another important key factor in the pathogenesis of acute otitis media in children is the status of the immune response. Children with **impaired immunoglobulin G production**, which is responsible for the neutralization of pathogens that have polysaccharide antigens, such as *Streptococcus pneumoniae*, are at an increased risk of developing acute otitis media.

On the other hand, children with **excess production of immunoglobulin E** are more prone to allergies and have been found to have an increased risk of eustachian tube dysfunction, hence are more likely to develop acute otitis media than normal children.

Clinical Presentation of Acute Otitis Media in Children

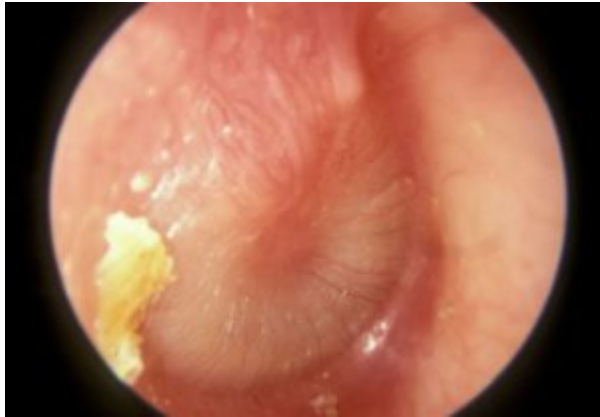


Image: "The middle ear is filled with a creamy white mucopurulent exudate which is causing the tympanic membrane to bulge laterally. Note the dilatation of the radial blood vessels of the tympanic membrane which appear like the spokes of a wheel." by Michael Hawke MD - Own work. License: [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)

Children who are older than one year usually present with **ear pain, purulent discharge from the ear** and **conductive hearing loss**. **Fever** is usually present. **Ear popping** and the feeling of **ear fullness** are also common symptoms of acute otitis media in children.

Pneumatic otoscopy can be used to visualize the eardrum which is usually red in color, shows bulging and might have purulent discharge in case of acute otitis media. **Tympanometry** can show elevated middle ear pressure, a sign of eustachian tube obstruction.

The most important clinical features that can help establish the diagnosis of acute otitis media in children are **bulging of the eardrum** and **clouding of the eardrum** in addition to **reduced mobility of the eardrum** on pneumatic otoscopy examination. The presence of **hearing loss** is also very important in children and is usually present.

Diagnostic Workup for Acute Otitis Media in Children

Routine laboratory investigations are not useful in establishing the diagnosis of acute otitis media in children as the probability of finding leukocytosis on a complete blood count is low. A recent study has shown that children with acute otitis media caused by non-typeable *Haemophilus influenzae* might have elevated serum levels of protein S100A12 and interleukin-10. The value of these markers in clinical practice has not been established.

Tympanocentesis is a procedure that allows for the aspiration of the fluid of the middle ear and the identification of the causative organism and its sensitivity profile. This is an invasive procedure that should be reserved for selected patients. Neonates younger than 6 weeks, immunocompromised children, or children who fail to respond to antibiotic therapy and develop sepsis should undergo a tympanocentesis.

Delayed diagnosis and inadequate treatment of acute otitis media in children can

cause **intracranial complications**, such as cerebral venous thrombosis and brain abscess formation.

Children with new-onset focal neurological signs suggestive of intracranial complications should undergo **magnetic resonance imaging of the brain**. Children with suspected acute rhinosinusitis should be evaluated clinically to confirm the diagnosis of acute rhinosinusitis. A **computed tomography scan** can help exclude sinusitis in children.

Pneumatic otoscopy can be used to visualize the eardrum which is usually red in color, shows bulging and might have purulent discharge in case of acute otitis media. **Tympanometry** can show elevated middle ear pressure, a sign of eustachian tube obstruction.

Treatment of Acute Otitis Media in Children

Symptomatic relief is important in the management of acute otitis media in children. Children usually have significant ear pain and fever. **Ibuprofen** and **acetaminophen** have been shown to have similar efficacy in the management of the symptoms of acute otitis media.

Children who appear healthy, despite having an acute otitis media, should be offered **conservative management** and antibiotics are better withheld. A **follow-up visit** should be scheduled within two or three days and, if no improvement is seen on the follow-up visit, **antibiotic therapy** should be initiated.

If the decision to start antibiotics is made, **amoxicillin** is the antibiotic of choice for the management of acute otitis media. Children who are allergic to amoxicillin should receive **trimethoprim-sulfamethoxazole** or **erythromycin-sulfamethoxazole**.

If antibiotic therapy is initiated, the recommended **duration of treatment is usually five days**. Antibiotic administration for ten days in children with acute otitis media failed to show any added benefits but was associated with a higher risk of developing side-effects and is therefore not recommended. The only drawback of a 5-day course of antibiotic therapy instead of 10-day course is the increased risk of relapse with the former.

Prognosis of Acute Otitis Media

The prognosis of acute otitis media in children after adequate **antibiotic therapy** is excellent. Hearing loss is usually reversible, and most children show significant symptomatic treatment within 48 hours of the initiation of antibiotic therapy.

References

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