



**ACUTE OTITIS MEDIA: THE MOST FREQUENT COMPLICATION OF
RHINOSINUSITIS IN YOUNG CHILDREN**

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Introduction. Otitis media frequently arises as a secondary condition following acute respiratory viral infections (ARVI). These infections often lead to mucosal swelling and inflammation of the paranasal sinuses. According to epidemiological findings from the EPOS 2020 guidelines, the global prevalence of viral-origin rhinosinusitis (ORSO) is estimated at 35–45%, depending on the region. In children under 3 years of age, approximately 20 cases per 100 are documented annually, increasing to 25 cases per 100 among adolescents aged 12 to 17. Acute otitis media (AOM) remains one of the most widespread illnesses affecting both pediatric and adult populations and is among the most frequent causes of antibiotic prescriptions—many of which may be inappropriate. This review highlights current data on the prevalence of AOM in Russian children and outlines the predominant viral and bacterial agents responsible. The term "ototropic" refers to viruses with a greater propensity to induce AOM.

Keywords: acute otitis media, rhinosinusitis, viral infection, diagnosis, treatment, young children, complications

Острый отит: Наиболее частое осложнение риносинусита у детей

Вступление. Средний отит часто возникает как вторичное заболевание после острых респираторных вирусных инфекций (ОРВИ). Эти инфекции часто приводят к отеку слизистой оболочки и воспалению придаточных пазух носа. Согласно эпидемиологическим данным, глобальная распространенность риносинусита вирусного происхождения (ORSO) оценивается в 35-45%, в зависимости от региона. Ежегодно регистрируется примерно 20 случаев на 100 детей в возрасте до 3 лет, а среди подростков в возрасте от 12 до 17 лет этот показатель увеличивается до 25 случаев на 100. Острый средний отит остается одним из наиболее распространенных заболеваний, поражающих как детское, так и взрослое население, и является одной из наиболее частых причин назначения антибиотиков, многие из которых могут оказаться неуместными. В этом обзоре представлены современные данные о распространенности ОТ детей и описаны основные вирусные и бактериальные возбудители, вызывающие данное заболевание.

Ключевые слова: острый отит, риносинусит, вирусная инфекция, диагностика, лечение, дети раннего возраста, осложнения

Anatomical Features of the Middle Ear in Young Children.

The anatomical characteristics of the middle ear in young children differ significantly from those in adults, contributing to the increased incidence and severity of otitis media in this age group:

External Auditory Canal:
In infants, the external auditory canal is underdeveloped—short, narrow, and with the bony portion represented only by the tympanic ring. As a result, pressure on the auricle during acute otitis media can cause a sharp pain response and heightened distress in the child.

Mastoid and Facial Nerve Relationship:

In children with an underdeveloped mastoid process, the lower wall of the auditory canal attaches to the styloid process, which lies almost horizontally and close to the descending branch of the facial nerve. This anatomical proximity increases the risk of facial nerve paresis and iatrogenic injury during procedures such as antrotomy.

Tympanic Membrane and Paracentesis Indications:

The tympanic membrane in young children is relatively thicker, round in shape, and positioned nearly horizontally. Consequently, despite the accumulation of inflammatory exudate in the tympanic cavity, visible bulging of the membrane may be absent—even when intoxication symptoms progress. Pus may instead drain into the mastoid cavity through a wide aditus.

Therefore, the criteria for paracentesis in infants and young children are broadened and include:

- a) sudden high fever,
- b) severe otalgia,
- c) pronounced systemic toxicity, particularly neurotoxicity,
- d) emerging signs of facial nerve dysfunction.

In immunocompromised or weakened children, paracentesis should be performed without delay.

Tympanic Cavity Walls:

In children under one year of age, the walls of the tympanic cavity are thin and may contain areas of dehiscence, allowing for rapid and unimpeded spread of infection.

Myxoid Tissue in the Middle Ear:

At birth, the middle ear is filled with embryonic myxoid tissue, which serves as a nutrient-rich environment for microbial growth. This contributes to the high frequency of otitis media in infants. Persistent myxoid tissue can lead to the formation of fibrous bands and partitions, impairing drainage and potentially causing hearing loss.

Eustachian Tube Anatomy:

In early childhood, the pharyngeal opening of the Eustachian tube lies at the level of the hard palate and posterior end of the inferior nasal concha, bordered posteriorly by a prominent mucosal ridge. During adenoidectomy, this anatomical feature must be considered to avoid scarring or stenosis of the Eustachian tube orifice, which could lead to conductive hearing loss.

Temporal Bone Fissures:

The petrous part of the temporal bone contains anatomical fissures that do not fully close until approximately four years of age. Consequently, acute otitis media in young children can present with severe symptoms that may mimic meningitis (meningism).

Mastoid Pneumatization:

The pneumatization of the mastoid process coincides with the replacement of diploic bone by compact bone, a process that typically completes between the ages of 8 and 12. This corresponds

to the full development of the mastoid air cell system.

Complications:

One of the severe complications is otogenic sepsis, which is often caused by pathogens such as Enterobacteriaceae and atypical hemolytic streptococcal strains. These microorganisms frequently show poor sensitivity to commonly prescribed antibiotics, complicating treatment. These clinical features are attributed to several anatomical characteristics of the pediatric ear. In newborns, the tympanic membrane is relatively thicker than in adults due to a more prominent fibrous layer and the properties of the embryonic mucosal tissue within the middle ear. The most frequent complication of acute otitis media (AOM) is acute mastoiditis. Other potentially severe complications include sinus thrombosis, otogenic meningitis, labyrinthitis, facial nerve paralysis, and intracranial abscesses.

In the early stages of AOM—particularly during the eustachian or catarrhal phase—the primary objective of therapy is the prevention of complications. Both conservative and surgical approaches aim to restore the function of the Eustachian tube. To reestablish adequate ventilation and drainage of the Eustachian tube, topical vasoconstrictors or astringent nasal drops are commonly prescribed to reduce mucosal edema. Children should be encouraged to blow their noses regularly, while in infants, nasal aspirators are used to remove secretions. For infants specifically, vasoconstrictive nasal drops should be administered approximately 10 minutes before feeding to prevent retrograde flow of nasal secretions into the Eustachian tube during swallowing. Local therapy includes the use of analgesic and anti-inflammatory ear drops, such as Otipax. Once the acute inflammatory process has subsided, otolaryngologists may recommend additional procedures, including Eustachian tube inflation (via the Politzer method or catheterization) and pneumatic massage of the tympanic membrane. At both the eustachian and acute stages of otitis media, systemic analgesics, such as ibuprofen or paracetamol, are routinely prescribed to manage pain and systemic symptoms.

Currently, no alternatives exist to antibiotic therapy (ABT) for treating acute bacterial otitis media (AOM).

- All infants under 6 months receive ABT upon suspected AOM, regardless of symptom severity.
- In children aged 6 months to 2 years, ABT is prescribed when the diagnosis is confirmed or initiated within 72 hours if uncertain.
- In children over 2 years, better symptom localization allows more selective use of ABT—typically only for severe cases or when otorrhea is present. Up to 60% of cases in this age group, especially those caused by *Haemophilus influenzae*, may resolve without antibiotics.

The decision to initiate ABT should weigh the risk of complications and potential for chronicity. Intracranial complications (e.g., brain abscess, meningoencephalitis) carry a mortality rate of up to 18.6%. Effective antibiotic therapy significantly reduces their incidence—from 2% to as low as 0.04–0.15%. Studies show that 90% of mild AOM cases in children over 2 years resolve without antibiotics, especially when caused by viruses or *H. influenzae*, and in the absence of high fever ($>38^{\circ}\text{C}$), severe pain, or systemic toxicity. If no improvement is seen within 24 hours, ABT should be started promptly.

The treatment of acute otitis media (AOM) depends on the stage of the disease, dominant symptoms, and the patient's overall health. Given that the Eustachian tube is the primary route of infection, therapy should focus on nasopharyngeal and nasal decongestion. Swelling of the nasal and nasopharyngeal mucosa—especially near the Eustachian tube orifice—impairs ventilation

and drainage of the middle ear, making vasoconstrictor nasal drops a key component of symptomatic care. Although many topical agents are available, local antibacterial drops do not replace systemic antibiotic therapy. For purulent AOM, antibiotics with proven in vitro efficacy against common pathogens are required. However, persistent symptoms occur in ~28% of cases, with high failure rates noted for co-trimoxazole (75%), amoxicillin (57%), cefaclor (37%), and cefixime (23%). The most effective agents are amoxicillin/clavulanate and azithromycin.

Amoxicillin and amoxicillin/clavulanate are preferred oral drugs, meeting key efficacy criteria. According to the AAP, children over 2 years with uncomplicated AOM do not benefit more from a 5-day vs. 10-day amoxicillin course. In contrast, children under 2 or those with tympanic membrane perforation should receive a 10-day course. High-dose amoxicillin (80–90 mg/kg/day) is recommended in cases with risk factors for resistant pathogens. Russian guidelines note that amoxicillin remains the most active oral β -lactam against penicillin-resistant *Streptococcus pneumoniae* among available penicillins and cephalosporins.

This issue is particularly relevant for children under three years of age. At the outpatient stage, treatment response should be assessed within 24 hours of the initial visit. If an otolaryngologist is unavailable during this period, a decision must be made regarding either hospitalization or daily pediatric supervision. Given these factors, this study aims to investigate the clinical characteristics and developmental aspects of acute and recurrent purulent otitis media in early childhood.

Materials and Methods:

The study analyzed medical records of 83 children, aged 1 to 3 years, hospitalized for acute or recurrent otitis media in the ENT department of TashPMI Clinic during 2022–2023. Data were assessed based on age, sex, and clinical presentation. Among these patients, 55 were boys and 28 were girls, yielding a male-to-female ratio of 2:1. The investigation revealed that catarrhal symptoms were common among the affected children: nasal congestion was observed in 80 patients (96%), mucous nasal discharge in 75 patients (90%), redness of the posterior pharyngeal wall in 25 patients (30%), cough in 54 patients (65%), and fever in 62 patients (74%). Several children showed signs of intoxication, including lethargy, decreased appetite, sweating, and disturbances in sleep patterns. A temperature response was recorded in all children participating in the study. Clinical manifestations of conjunctivitis were noted in 28% of the children, while orbital complications occurred in 2%, and sinus thrombosis was present in 0.1% of cases.

The clinical presentation of ear diseases in young children typically enables general practitioners to make an accurate diagnosis and determine the appropriate management for the patient.

Moreover, given the risk of serious intracranial complications arising from otogenic infections, prompt treatment of acute otitis media is critical and can be life-saving. In light of the widespread shortage of specialized pediatric otolaryngology services, the initial responsibility for assessing a sick child often rests with the pediatrician. This article reviews the current classification of acute otitis media, the key morphofunctional factors contributing to its development in children, the clinical features, diagnostic approaches, and primary treatment protocols for acute middle ear disease in the pediatric population. Acute otitis media should be understood as an inflammatory condition affecting the mucosal lining of the air-filled cavities of the middle ear. Importantly, this pathology is not confined to the tympanic cavity alone but involves, to varying degrees, all cavities within the temporal bone.

Conclusions:

The often latent course and nonspecific symptoms of acute otitis media frequently delay timely otolaryngologist evaluation, especially in cases lacking classical signs such as fever, ear pain, or purulent discharge. Pain assessment depends on the child's individual tolerance; therefore, careful observation and correlation with parental reports are essential to obtain an accurate clinical picture. Parental history is valuable—for instance, a child who cries during breastfeeding but not spoon-feeding may indicate ear involvement. Additional signs include crying during sleep, ear pulling, head rubbing, and increased distress upon tragus pressure. Otoscopy alone may be inconclusive, as tympanic membrane hyperemia can result from crying rather than infection, and purulent exudate may be absent due to drainage via a wide Eustachian tube.

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