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The Relationship Between Upper Respiratory Tract Infections and the Incidence of Acute Otitis Media in Children: A Literature Review

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Abstract

Upper respiratory tract infection (URTI) is one of the most common illnesses in children and may lead to complications, one of which is acute otitis media (AOM). Children are more susceptible to AOM because their Eustachian tubes are relatively shorter and more horizontal, with immature drainage function. URTI can cause inflammation and edema of the nasopharynx, impairing Eustachian tube function and increasing the risk of AOM. This study was a literature review. A total of 10 journals published between 2021 and 2025 were reviewed and synthesized to determine the association between URTI and AOM in children, including relevant risk factors and pathogens. The review showed an association between URTI and AOM in children. Cantika et al. (2025) reported a statistically significant association with a p-value of 0.019, while Azzahra et al. (2025) reported a p-value of 0.033 with a PR of 1.35. Several viruses, particularly respiratory syncytial virus (RSV) and rhinovirus, were associated with AOM. Age, Eustachian tube anatomy, exposure to cigarette smoke, and air pollution may also increase the risk of AOM.URTI is associated with the occurrence of AOM in children through an inflammatory process that impairs Eustachian tube function and middle ear ventilation. Early detection of URTI, immunization, and control of environmental risk factors are needed to reduce the risk of AOM in children.

Introduction

Acute Respiratory Infections (ARI) are a leading cause of morbidity and mortality from infectious diseases worldwide. Mortality rates are particularly high among infants, children, and the elderly, especially in low- and middle-income countries. Furthermore, ARI is a primary reason for medical consultations and hospital admissions, particularly in pediatric care settings. While ARI can be caused by various microorganisms, viral and bacterial infections are the most common culprits. Factors influencing the spread of respiratory infections include environmental conditions, poor personal and public health behaviors, and nutritional deficiencies (Insan et al., 2023; Othman et al., 2024; Akhyar et al., 2026; Sundas et al., 2024). Although most ARI cases are mild and resolve spontaneously, upper respiratory tract infections can lead to complications in adjacent organs, one of which is acute otitis media (AOM) (Damsaz & Akhlaghipour, 2024; Saranya et al., 2024; i Brú, 2022; Paul, 2024).

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Acute Otitis Media (AOM) is a middle ear infection that frequently affects children; it is characterized by acute inflammation resulting from Eustachian tube dysfunction, which leads to the retention of secretions and facilitates the colonization of pathogenic bacteria. This condition is commonly triggered by upper respiratory tract infections, causing rapid inflammation and symptoms such as fever, otalgia (ear pain), and temporary hearing impairment. Anatomical factors also play a role. In children, the Eustachian tube is shorter, more horizontal, and narrower, resulting in suboptimal mucociliary clearance mechanisms (Goulioumis et al., 2022; Udagatti & Kumar, 2025; Ashour et al., 2026). These characteristics make obstruction and fluid retention more likely, placing children under five at a higher risk of developing AOM compared to other age groups (Ramanda et al., 2026; Cameron & Rueda, 2024).

AOM is closely linked to upper respiratory tract infections; 94% of patients with upper respiratory tract infections go on to develop AOM. One in three children who contract an upper respiratory tract infection will subsequently develop AOM (Fan et al., 2023; Zakiyyah et al., 2024). Upper respiratory tract infections (URTIs) lead to nasopharyngitis and impair Eustachian tube function; given the nasopharynx's proximity to the ear, infection can spread there due to abnormalities in the mucociliary system and Eustachian tube dysfunction. This results in negative pressure within the middle ear, drawing nasopharyngeal mucus into the middle ear cavity a mechanism that explains the presence of bacteria such as Streptococcus pneumoniae, Haemophilus influenzae, and Moraxella catarrhalis in the fluid associated with acute otitis media (AOM). The high prevalence of URTIs makes otitis media a frequently encountered condition in pediatric practice (Simbolon et al., 2024; Egamberdiyeva, 2026; Nadeem et al., 2024; Turyasiima et al., 2024).

A history of acute respiratory infections (ARI) increases the risk of bacterial infiltration into the Eustachian tube, which can exert pressure on the eardrum, potentially triggering perforation and the development of chronic suppurative otitis media (CSOM) (Klimek et al., 2025; Bustamante et al., 2025). Other literature confirms that ARI is a causative factor for CSOM. The rise in ARI cases is influenced by a lack of access to health education, low socioeconomic status, and limited healthcare services. Recurrent ARI also leads to increased fluid discharge from the ear, contributing to CSOM. ARI is frequently caused by viral or bacterial infections affecting the upper respiratory tract, including the nasopharynx (Sandybayev et al., 2024). These infections can cause inflammation that disrupts Eustachian tube function, thereby impairing its ability to balance pressure within the middle ear. When this function is compromised, fluid can become trapped in the middle ear, creating an environment conducive to bacterial growth and subsequent ear infections (Maharani et al., 2025). Acute otitis media (AOM) in children presents not only as an acute condition involving rapid-onset middle ear inflammation of short duration typically less than three weeks but also carries broader implications. Common symptoms include fever, ear pain, hearing loss, and ear discharge. AOM can significantly impact a child's development, particularly regarding hearing, language, and cognition. Hearing impairment resulting from recurrent middle ear infections can lead to delays in speech and language development, as well as learning difficulties at school. Children with chronic or recurrent AOM are also prone to attention deficits and low social participation, and they face a risk of declining academic performance. In the long term, the resulting communication impairments can affect a child's self-confidence and social skills, potentially hindering their emotional and social development (Mahendra et al., 2025; Mubarokah & Imtihana, 2026). Therefore, preventing and managing risk factors for acute otitis media (AOM) including acute respiratory infections (ARIs) is crucial for safeguarding children's hearing health and overall development (Dermawan et al., 2025).

Age is the risk factor most strongly associated with AOM; the condition occurs most frequently in children. Anatomical factors play a role: during childhood, the Eustachian tube is positioned

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more horizontally and offers less effective drainage compared to adulthood, thereby predisposing children to AOM (Hastuti, 2024; Klimek et al., 2025). ARIs can affect infants, children, and the elderly alike. Although ARIs can strike anyone at any time, young children are at higher risk (Priatna et al., 2025). Consequently, the link between ARIs and AOM represents a significant aspect of child health.

Research by Simbolon et al. (2024) identified a significant association between upper respiratory tract infections (URTIs) and the incidence of acute otitis media (AOM) in children. Data indicate that children suffering from URTIs face a higher risk of developing AOM compared to those without URTIs. The study also found that AOM is more common among boys and children under the age of three. The primary symptoms reported by AOM patients were ear pain and ear discharge, with the perforation stage being the most frequently observed. This research underscores the importance of early detection and appropriate management of URTIs to prevent the progression to AOM and subsequent complications.

Examining the relationship between URTIs and AOM is crucial, as both conditions are frequently encountered in the pediatric population and share anatomical and pathophysiological links. A better understanding of this relationship can assist healthcare professionals in identifying children at high risk of developing AOM during a URTI episode. Furthermore, the timely detection and management of URTIs are expected to help reduce middle ear complications and prevent long-term impacts on hearing function and child development.

Therefore, a literature review is needed to compile and analyze research findings regarding the association between upper respiratory tract infections and the incidence of acute otitis media in children. This review aims to provide a comprehensive overview of the mechanisms linking URTIs and AOM, the contributing risk factors, and the scientific evidence regarding the increased incidence of AOM in children with URTIs. Based on this background, the researcher intends to conduct a study titled "The Relationship Between Upper Respiratory Tract Infections and the Incidence of Acute Otitis Media in Children: A Literature Review."

Methods

This study employs a literature review method by searching for, identifying, examining, and analyzing various prior studies regarding the relationship between upper respiratory tract infections (URTI) and the incidence of acute otitis media (AOM) in children. Literature searches were conducted via Google Scholar, PubMed, ResearchGate, Elsevier, and NCBI using Indonesian and English keywords related to URTI, AOM, and children, combined with the Boolean operators AND and OR. Selected literature consisted of articles published between 2021 and 2026, written in Indonesian or English, addressing the relationship between URTI and AOM in children, involving a pediatric population, and utilizing clear research methodologies. Articles classified as literature reviews, systematic reviews, meta-analyses, editorials, or case reports were excluded from the study.

Articles meeting the criteria were subsequently selected through a review of their titles, abstracts, and full content. The obtained data were summarized based on study characteristics, populations, variables, risk factors, and findings regarding the relationship between URTI and AOM. Furthermore, the research results were analyzed descriptively and synthesized narratively by comparing similarities and differences in findings across studies. The synthesis results were used to provide an overview of the relationship between URTI and the incidence of AOM in children, as well as the factors that may influence this relationship.

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Result and Discussion

Table 1. Summary of Previous Studies on the Relationship Between Upper Respiratory Tract Infections and Acute Otitis Media in Children

Article	Design	Research purposes	Participants	Result	Conclusion
Literature Review: The Relationship of Upper Respiratory Tract Infections with Acute Otitis Media in Children (Maghfirah Tara Zakiyyah, Andi Tenri Sanna Arifuddin, & Amira Trini Raihanah, 2025)	Literature review	Analyzing the relationship between upper respiratory tract infections (URTI) and the incidence of acute otitis media (AOM) in children based on the results of previous studies.	5 relevant research articles on the relationship between acute respiratory infections (ARI) and acute otitis media (AOM) in children.	The review indicates that acute respiratory infection (ARI) is one of the risk factors most frequently associated with the occurrence of acute otitis media (AOM) in children. Anatomical characteristics of the Eustachian tube in children specifically its more horizontal orientation and suboptimal drainage also contribute to an increased risk of AOM following a respiratory tract infection.	There is an association between upper respiratory tract infections and the occurrence of acute otitis media in children. Upper respiratory tract infections can be a significant predisposing factor for the development of acute otitis media in children.
The Effect of URTI on the Incidence of Acute Otitis Media in Children Aged 0–5 Years at the ENT Polyclinic of PHC Hospital Surabaya (Cinta Cantika, Wiyono Hadi, & Gladdy Lysias Waworuntu, 2025)	Observational analytic study, cross-sectional	To determine the influence of or relationship between upper respiratory tract infections and the incidence of acute otitis media (AOM) in children aged 0–5 years at the ENT Clinic of PHC Hospital, Surabaya.	45 children aged 0–5 years who visited the ENT clinic between January and December 2022 and met the study criteria.	A total of 19 children (42%) experienced URTI and OMA, 6 children (13%) experienced OMA without URTI, and 20 children (44%) experienced URTI without OMA. Statistical analysis yielded a p-value of 0.019 and a contingency coefficient of 0.331, indicating a significant association of moderate strength between URTI and OMA.	URTI is significantly associated with the occurrence of OMA in children aged 0–5 years. Study results indicate that children with URTI have a higher risk of developing OMA.

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The Relation Between Upper Respiratory Tract Infection (URTI) and Allergic Rhinitis with Acute Otitis Media in THT-KL Polyclinic RSUDZA Banda Aceh (Irchi Amanda Azzahra, Benny Kurnia, Husnah, Dina Alia, & Nurjannah, 2025)	Observational analytic study, cross-sectional	To determine the association of acute respiratory infections (ARI) and allergic rhinitis with the incidence of acute otitis media (AOM) at the ENT-HNS Clinic of RSUDZA Banda Aceh from January 2022 to December 2023.	2,178 patients based on medical record data using total sampling technique.	A total of 227 patients (10.4%) had acute otitis media (AOM), 448 (20.6%) had acute respiratory infection (ARI), and 225 (10.3%) had allergic rhinitis. The association between ARI and AOM showed p = 0.033; PR = 1.35; 95% CI: 1.02–1.79. This indicates that patients with ARI were 1.35 times more likely to develop AOM.	There is a significant association between acute respiratory infection (ARI) and acute otitis media (AOM). Additionally, allergic rhinitis is also associated with AOM, with a stronger association than that observed with ARI.
Relationship Between Upper Respiratory Tract Infection and Acute Otitis Media in Children (Novita Prawitasari, Dahliah, Silva Sari C. P., Hermiaty N., & Syamsu Rijal, 2025)	Qualitative literature review	Analyzing the relationship between upper respiratory tract infections (URTI) and ear infections/otitis media in children based on various previous research findings.	Relevant research literature on URTI and otitis media in children.	The findings indicate that upper respiratory tract infections (URTIs) particularly viral infections such as nasopharyngitis can impair Eustachian tube function, thereby increasing the risk of ear infections. Factors such as the child's age, air pollution, and exposure to cigarette smoke can also exacerbate this condition.	There is a link between upper respiratory tract infections (URTIs) and the incidence of otitis media in children. Prevention and early management of URTIs, vaccination, and a healthy environment can help reduce the incidence of otitis media.
Identification of the Viral Pathogens in School Children With Acute Otitis Media in Central Java, Indonesia (Anton Budhi Darmawan, Aghnianditya Kresno Dewantari, Hanifah Fajri Maharani Putri, Ageng Wiyatno, Daniel Joko Wahyono, & Dodi Safari, 2023)	Observational laboratory-based study	To identify the types of viral pathogens present in the nasopharynx of school-aged children with acute otitis media (AOM) and to describe the spectrum of respiratory viruses associated with AOM in Indonesia.	119 schoolchildren with acute otitis media (AOM) in Banyumas Regency, Central Java, Indonesia.	A total of 37 out of 119 nasopharyngeal samples (31.1%) tested positive for the virus. The most prevalent virus was human rhinovirus B (32.4%), followed by rhinovirus C (29.7%), rhinovirus A (27%), and human bocavirus (5.4%).	Rhinovirus is the predominant respiratory viral pathogen in school-aged children with acute otitis media (AOM) in Central Java. These findings support the role of respiratory viral infections in the development of AOM in children.

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Epidemiology of Respiratory Viruses in Pediatric Acute Otitis Media During the COVID-19 Pandemic: A Cross-Sectional Study (Omar Majadla, Avital Fellner, Yuval Mizrakli, Zeev Hirschfeld, Limor Muallem-Kalmovich, Haim Gavriel, & Jacob Pitaro, 2025)	Cross-sectional study	Analyzing the epidemiology of respiratory viruses in children with respiratory tract infections and acute otitis media (AOM), and comparing viral patterns before and during the COVID-19 pandemic.	376 children aged ≤6 years with respiratory tract infections and uncomplicated acute otitis media. The median age was 17.6 months, and 61.2% were male.	Prior to the pandemic, detection rates were 12.5–28.8% for RSV, 18.5–28.3% for adenovirus, and 7.7–24.7% for influenza. During the first year of the pandemic, RSV and influenza were not detected. In the second year, detection rates rose to 33.1% for RSV, 29.4% for adenovirus, and 5.8% for influenza.	Respiratory viral infections play a significant role in pediatric acute otitis media (AOM). Changes in viral epidemiology during the pandemic indicate that controlling the spread of respiratory infections can influence the incidence of AOM in children.
Case-Control Study of Relationship of Infection by Respiratory Viruses with Acute Otitis Media in Chinese Children (Yue Fan, Dongdong Li, Pu Wang, Lili Ren, & Xiaowei Chen, 2023)	Case-control study	Analyzing the relationship between various respiratory viral infections and the occurrence of acute otitis media (AOM) in children with upper respiratory tract infections (URIs).	255 children with URIs, with a mean age of 32.9 ± 18.7 months. Samples were examined using nasopharyngeal swabs to detect various respiratory viruses.	A total of 164 children (64.1%) tested positive for at least one respiratory virus. The most frequently detected viruses were RSV (24.3%), parainfluenza virus (15.5%), and influenza A (13.8%). RSV positivity was significantly higher in the URI + OMA group compared to the URI-only group. No significant differences were found for the other nine viruses.	There is an association between respiratory viral infections and acute otitis media (AOM) in children. Upper respiratory infections (URIs) involving RSV significantly increase the risk of developing AOM in children.
Air Pollutants, Seasonal Influenza, and Acute Otitis Media in Children: A Population-Based Analysis Using 22-Year Hospitalization Data (Conglu Li, Xiaoting Jiang, Yuchen Wei, Yawen Wang, Xiangqian Lao, Qianying Yue, & Ka	Population-based retrospective study dengan analisis time-series	Analyzing the relationship between air pollution, seasonal influenza, meteorological factors, and the incidence of AOM in children.	21,224 children aged ≤15 years treated for acute otitis media (AOM) in Hong Kong during the period 1998–2019.	The cumulative risk of acute otitis media (AOM) increased with rising exposure to influenza-like illness (ILI). At the 95th percentile of total ILI, the adjusted relative risk (ARR) reached 1.42 (95% CI 1.29–1.56). The ARR also increased for influenza A/H1N1, A/H3N2, and influenza B. Exposure to oxidant gases was also associated with an	Seasonal influenza and environmental factors such as air pollution are associated with an increased incidence of acute otitis media (AOM) in children. Controlling air pollution and influenza vaccination have the potential to help prevent AOM.

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Chun Chong, 2024)				increased risk of AOM (ARR 1.15; 95% CI 1.04–1.28).	
Evaluation of Clinical Graded Treatment of Acute Nonsuppurative Otitis Media in Children with Acute Upper Respiratory Tract Infection (Wei Meng, Dong-Dong Huang, Guang-Fei Li, Zi-Hui Sun, & Shuang-Ba He, 2021)	Observational clinical study	Evaluating management based on severity in children with acute non-suppurative otitis media caused by acute upper respiratory tract infection.	420 children with acute non-suppurative otitis media treated in the emergency department between September 2015 and December 2018.	Patients are classified into grades I–III based on the condition of the tympanic membrane and systemic reactions. Grade I cases can be managed through clinical observation. For grade II, anti-inflammatory therapy offers therapeutic benefits. In grade III cases, the use of third-generation cephalosporins and hormonal therapy helps alleviate symptoms and local aural reactions.	Non-suppurative acute otitis media (AOM) can occur as a complication of an acute upper respiratory tract infection. Management based on severity can help alleviate symptoms and prevent complications such as tympanic membrane perforation.
Acute Otitis Media in Children 6 Months to 2 Years of Age (Ran D. Goldman, 2022)	Clinical review / Evidence-based review	Reviewing recent developments regarding the epidemiology, diagnosis, and management recommendations for acute otitis media (AOM) in children aged 6 months to 2 years, particularly during periods of high upper respiratory tract infection incidence.	Children aged 6 months to 2 years who are the focus of various studies and reviewed clinical guidelines.	Although the incidence of acute otitis media (AOM) has declined following increased pneumococcal immunization coverage, it remains one of the most common infectious diseases in children. AOM is frequently encountered during seasons with high rates of upper respiratory tract infections. Diagnosis is based on acute symptoms, middle ear inflammation, and the presence of effusion. Management is tailored to the severity of the disease.	Acute otitis media (AOM) remains a common health issue in children and is frequently associated with upper respiratory tract infections. Early detection and appropriate management are crucial to preventing complications that can affect a child's hearing and quality of life.

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Upper respiratory tract infections (URTIs) are among the most common infectious diseases in children. URTIs can affect the nose, paranasal sinuses, pharynx, tonsils, larynx, and the proximal trachea. The high incidence of URTIs in children is associated with their developing immune systems and exposure to various infectious agents. A frequently observed complication following an upper respiratory tract infection is acute otitis media (AOM)—an acute infection and inflammation of the middle ear that can cause ear pain, fever, and hearing impairment, while also affecting a child's quality of life and development (Zakiyyah et al., 2024).

Acute otitis media is a common condition in the pediatric population. Children are at higher risk of developing AOM than adults due to the anatomical characteristics and immature function of the Eustachian tube. In childhood, the Eustachian tube is positioned more horizontally, is shorter, and has suboptimal drainage function. These conditions allow secretions from the nasopharynx to reach the middle ear more easily, leading to impaired ventilation and fluid accumulation. Consequently, upper respiratory tract infections can serve as a significant triggering factor for the development of AOM in children (Prawitasari et al., 2025).

The link between URTIs and AOM primarily involves Eustachian tube dysfunction resulting from inflammation in the respiratory tract. Viral infections of the nasopharynx can cause edema and inflammation of the Eustachian tube mucosa, thereby disrupting middle-ear ventilation. This disruption creates negative pressure in the middle ear, facilitating the retention of secretions, microbial colonization, and inflammation, which can ultimately progress to AOM. Nasopharyngitis, a form of upper respiratory tract infection, can also increase the risk of ear infections through this mechanism (Prawitasari et al., 2025).

Research by Cantika et al. (2025) demonstrated a significant association between upper respiratory tract infections (URTI) and the occurrence of acute otitis media (AOM) in children aged 0–5 years at the ENT Clinic of PHC Hospital, Surabaya. Among the 45 children studied, 19 (42%) experienced both URTI and AOM concurrently, 6 (13%) had AOM without URTI, and 20 (44%) had URTI without AOM. Statistical analysis yielded a p-value of 0.019 and a contingency coefficient of 0.331, indicating a significant association of moderate strength between URTI and AOM. These findings suggest that children with URTI are more likely to develop AOM.

Research by Azzahra et al. (2025) further reinforces the link between acute respiratory infections (ARI) and acute otitis media (AOM). A study conducted at the ENT-KL Outpatient Clinic of RSUDZA Banda Aceh involving 2,178 patients revealed that 227 patients (10.4%) had AOM and 448 patients (20.6%) had ARI. Chi-square test results indicated a significant association between ARI and AOM ($p = 0.033$; PR = 1.35; 95% CI: 1.02–1.79). These results suggest that patients with ARI are 1.35 times more likely to develop AOM compared to those without ARI. The study also demonstrated that other factors, such as allergic rhinitis, can increase the risk of AOM.

These findings align with the study by Fan et al. (2023), a case-control study involving 255 children with respiratory tract infections in Beijing, China. A total of 164 children (64.1%) tested positive for at least one respiratory virus. The most frequently detected viruses were respiratory syncytial virus (RSV), parainfluenza virus, and influenza A. RSV positivity was significantly higher in the group of children with ARI accompanied by AOM compared to the group with ARI without AOM. These findings indicate that RSV-induced ARI can increase the risk of AOM in children, thereby reinforcing the role of respiratory viral infections in the pathogenesis of AOM.

Research by Darmawan et al. (2023) in Central Java, Indonesia, also demonstrated the involvement of respiratory viruses in children with AOM. The study analyzed nasopharyngeal

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samples from 119 school-aged children with AOM in Banyumas Regency. A total of 37 samples (31.1%) tested positive for respiratory viruses. The most dominant virus was human rhinovirus B (32.4%), followed by rhinovirus C (29.7%), rhinovirus A (27%), and human bocavirus (5.4%). Rhinoviruses are the most frequently detected viral pathogens in school-aged children with acute otitis media (AOM). These findings indicate that upper respiratory tract viral infections may play a role in the development of AOM in children.

Research by Majadla et al. (2025) further reinforces the link between respiratory tract infections and AOM through the identification of various respiratory viruses in children. This cross-sectional study involved 376 children aged ≤6 years suffering from respiratory tract infections and AOM. Prior to the COVID-19 pandemic, RSV was detected in 12.5–28.8% of cases, adenovirus in 18.5–28.3%, and influenza in 7.7–24.7%. During the second year of the pandemic, detection rates rose to 33.1% for RSV and 29.4% for adenovirus, while influenza fell to 5.8%. These shifts in viral epidemiological patterns demonstrate that the spread of respiratory viruses is closely associated with the incidence of AOM in children and that controlling respiratory infections can influence AOM occurrence.

In addition to viral types, environmental factors can also influence the incidence of acute otitis media (AOM) in children. Li et al. (2024) conducted a population-based analysis using 22 years of hospitalization data from Hong Kong, identifying 21,224 hospital admissions for AOM among children aged ≤15 years. The risk of AOM increased alongside rising rates of influenza-like illness (ILI). At the 95th percentile of total ILI rates, the adjusted relative risk (ARR) for AOM reached 1.42 (95% CI 1.29–1.56). Beyond influenza, exposure to oxidant gases was also associated with an increased risk of AOM, with an ARR of 1.15 (95% CI 1.04–1.28). These results indicate that respiratory infections and environmental factors may act synergistically to increase the risk of AOM.

A study by Meng et al. (2021) examined children with acute non-suppurative otitis media associated with acute upper respiratory tract infections (URIs). A total of 420 children were classified into disease severity grades ranging from I to III. The findings demonstrated that AOM can manifest as a complication following an upper respiratory tract infection. Management strategies varied according to severity; Grade I patients could be managed through clinical observation, whereas patients with more severe disease required more intensive therapy. These findings highlight the importance of early recognition and management of AOM in children with URIs to prevent complications such as tympanic membrane perforation.

The link between URIs and AOM is further supported by Goldman (2022), who noted that AOM is one of the most common conditions in children aged 6 months to 2 years and frequently occurs during seasons with high rates of upper respiratory tract infections. Although the incidence of AOM has declined with the increased use of pneumococcal vaccines, it remains a common health issue among children. Acute otitis media (AOM) can also lead to complications that affect hearing and quality of life. Therefore, diagnosis based on the onset of acute symptoms, middle ear inflammation, and effusion along with appropriate management is essential.

A literature review by Zakiyyah et al. (2024), which analyzed five relevant studies, also indicates a link between upper respiratory tract infections (URTIs) and the incidence of AOM in children. URTIs are among the most frequently identified risk factors for AOM. This association is linked to the anatomical characteristics of the Eustachian tube in children, whose bodies are still developing; the tube's more horizontal orientation and suboptimal drainage allow secretions and microorganisms from the nasopharynx to more easily affect the middle ear. Thus, upper respiratory tract infections can serve as a significant predisposing factor for the development of AOM.

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Research by Prawitasari et al. (2025) also concludes that there is a link between upper respiratory tract infections (URTIs) and ear infections in children. Viral infections such as nasopharyngitis can impair Eustachian tube function and increase the risk of ear infections. In addition to this mechanism, factors such as the child's age, air pollution, and exposure to cigarette smoke can exacerbate respiratory tract conditions and increase the likelihood of ear infections. Preventive efforts through increasing parental knowledge regarding the early detection of URTIs, vaccination, and maintaining a healthy environment are crucial for reducing the incidence of acute otitis media (AOM).

Based on these studies, it is evident that the relationship between URTIs and AOM in children is not solely due to the direct presence of an infection; it also involves interactions among infectious agents, inflammatory responses, Eustachian tube function, age-related characteristics, and environmental factors. Viral infections such as RSV and rhinovirus can trigger inflammation in the nasopharynx, subsequently leading to Eustachian tube dysfunction. This condition disrupts middle ear ventilation and drainage, creating an environment conducive to infection and inflammation.

Thus, it can be concluded that upper respiratory tract infections are significantly associated with the incidence of acute otitis media in children. Children with URTIs face a higher risk of developing AOM, primarily due to impaired Eustachian tube function and the involvement of various respiratory viruses. Factors such as age, air pollution, exposure to cigarette smoke, and seasonal infections can further strengthen this association. Therefore, early detection and management of URTIs, increased immunization coverage, control of environmental factors, and parental education regarding the signs of AOM are essential components of efforts to prevent AOM as a complication of URTIs in children.

Conclusion

Reviews and analyses of various studies indicate a significant association between upper respiratory tract infections (URTIs) and the occurrence of acute otitis media (AOM) in children. URTIs particularly those of viral origin can trigger inflammation and edema in the nasopharynx and impair Eustachian tube function. These conditions disrupt middle ear ventilation and drainage, thereby increasing the risk of developing AOM. Evidence consistently shows that children with URTIs are more likely to develop AOM. A study by Cantika et al. (2025) demonstrated a significant association between URTI and AOM in children aged 0–5 years ($p = 0.019$), while Azzahra et al. (2025) found that patients with URTI had a 1.35 times higher likelihood of developing AOM. These findings are supported by research from Fan et al. (2023), which showed that RSV infection in children with URTI significantly increases the risk of AOM.

In addition to URTIs, several other factors contribute to the incidence of AOM, including the child's age, anatomical characteristics of the Eustachian tube, the type of respiratory virus, exposure to cigarette smoke, air pollution, and seasonal influenza infection. Research by Darmawan et al. (2023) highlighted the predominance of rhinovirus in children with AOM, whereas Majadla et al. (2025) identified various respiratory viruses—including RSV, adenovirus, and influenza in children presenting with respiratory tract infections and AOM. These findings indicate that the pathogenesis of AOM is multifactorial and closely linked to respiratory tract infections. Thus, URTI is a significant factor associated with the onset of AOM in children. Early detection and management of acute respiratory infections (ARI), prevention of respiratory infections, increased immunization coverage, and control of environmental factors can serve as important strategies to reduce the risk of acute otitis media (AOM) and its complications, including hearing impairment and reduced quality of life for children.

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