

Clinical, subclinical characteristics and some associated factors to treatment result of acute otitis media at Hai Phong Children's Hospital

Tung Anh Dinh Duong^{1,2*}, Thanh Pham Tien¹, Tung Do Van³, Thi Ngoc Pham¹, Anh Hong Vu Thi¹, Viet Ha Nguyen¹

ABSTRACT

Background: This study aimed to describe the clinical and subclinical characteristics of acute otitis media (AOM) in patients at Haiphong Children's Hospital (HCH) between January 1 and December 31, 2021, and to evaluate factors affecting treatment outcomes. **Methods:** We analyzed data from 76 inpatients aged 2 months to <15 years with AOM who underwent a culture test for ear pus or sinus fluid during 2021. **Results:** The majority of AOM cases occurred in children aged 6 months to 2 years, with a male-to-female ratio of 1.5:1. Otorrhea was the most common symptom, followed by fever and ear pain. Tympanic otoscopy was the most reliable diagnostic method. *S. pneumoniae* and *H. influenzae* were the most common pathogens. Most patients responded well to medical treatment, though *H. influenzae* infections were more likely to require surgical intervention. **Conclusions:** Children with ear symptoms such as otorrhea or otalgia should seek prompt medical attention to prevent complications like pus accumulation in the tympanic cavity. The need for surgical intervention is increased in AOM patients infected with *H. influenzae*.

Keywords: children, acute otitis media, otorrhea, *H. influenzae*

¹ Hai Phong University of Medicine and Pharmacy, Vietnam.

² Hai Phong Children's Hospital, Vietnam.

³ Military Hospital division 7, Vietnam.

* Corresponding author

Tung Anh Dinh Duong
Email: ddtanh@hpmu.edu.vn

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INTRODUCTION

Otitis media is a common condition that includes various forms such as acute otitis media (AOM), serous otitis media, chronic otitis media, and otitis media with pus. AOM, characterized by rapid onset and severe symptoms, is a leading cause of hospitalization, particularly in children. Approximately 10% of the global population experiences AOM annually, with a higher incidence in developing countries, especially in sub-Saharan and West Africa. Of those affected, 51% are children under five years old, with an estimated 709 million new AOM episodes each year. The highest incidence rates occur in children aged 1–4

years, peaking during the first year of life [1, 2]. AOM can result from various causes, including trauma, improper ear care, foreign bodies, and infections by bacteria, viruses, and fungi. Symptoms typically appear within 48 hours and can include fever, irritability, lethargy, anorexia, vomiting, loss of balance, cough, sore throat, earache, and ear discharge. While AOM is often manageable, improper treatment can lead to complications ranging from mild issues like hearing loss to severe conditions such as chronic otitis media, labyrinthitis, and brain infections [1]. Early detection and assessment of symptoms are crucial for timely medical intervention to prevent both acute and long-term complications [3]. This

research aimed to achieve the following two objectives:

1. To describe the clinical and subclinical characteristics of acute otitis media in patients at Haiphong Children's Hospital from January 1st, 2021 to December 31st, 2021.

2. To evaluate some associated factors influencing the treatment outcomes of these patients.

METHOD

Subjects

Inclusion Criteria

All medical records of patients aged 1 month to ≤ 15 years who were diagnosed with acute otitis media and treated at the Oto-Rhino-Laryngology (ORL) department of Hai Phong Children's Hospital from January 1, 2021, to December 31, 2021, were included. These patients underwent a culture test for ear pus or sinus fluid. The diagnostic criteria for acute otitis media (AOM) includes the presence of symptoms such as fever (or absence of fever), earache, or symptoms that may be indicative of earache, such as crying or signs of nasopharyngitis (e.g., runny nose, stuffy nose). Physical examination may reveal lesions such as a swollen and congested eardrum, loss of the cone of light, bulging of the eardrum, or the presence of fluid in the eardrum. In some cases, there may be perforation with fluid or pus flowing out of the external ear canal [4].

Exclusion Criteria

- Medical records with incomplete research information or of patients with ear trauma and intermediate-level inflammation.
- Medical records of patients with tympanic tubes, cochlear implants,

congenital head deformities, or other serious infections (such as renal insufficiency, heart failure, malignant tumors, immune dysfunction, or other severe diseases).

- Medical records of patients who discontinued treatment before completion.

- Medical records of patients who were admitted to another healthcare facility prior to being hospitalized in the ORL department.

Research Methods

Research Design: Descriptive study of a series of cases using retrospective data.

Sample Size and Sample Selection: The sample size was determined by convenience sampling, including all medical records of patients who met the diagnostic criteria during the study period.

Information Collection Method: Research data were collected from medical records that met the research standards and were selected using a pre-designed medical record form.

Data Processing: Data were processed and analyzed using SPSS 23.0 (IBM®, USA) software. Descriptive statistics, including percentages, averages, and the χ^2 test, were used to compare proportions.

Research ethics

This research was conducted with the approval of the Graduation Thesis Research Proposal Review Committee of Hai Phong University of Medicine and Pharmacy (Decision No. 1280/TB-YDHP, dated October 18, 2021) and Hai Phong Children's Hospital. Patient information was collected anonymously, in compliance with confidentiality principles, and was used solely for research purposes. Data collection was carried out accurately and honestly.

RESULTS

Through a survey of 76 cases of acute otitis media (AOM) at the ORL department of Hai Phong Children's Hospital (HCH), we obtained several significant research findings.

Table 1. Demographic characteristics of acute laryngitis (n=76)

Characteristics	No. of cases	Ratio (%)	
Age	<2 months	2	2.6
	2 - <6 months	4	5.3
	6 - <24 months	44	57.9
	24 - 60 months	24	31.6
	≥60 months	2	2.6
Geographic location	Suburban area	55	72.4
	Urban area	21	27.6
Sex	Male	46	60.5
	Female	30	39.5
Chief complaint	Ear fluid drainage	26	34.3
	Fever	22	28.9
	Ear pain	17	22.4
	Runny nose	6	7.9
	Irritability	3	3.9
	Headache	1	1.3
	Cough	1	1.3

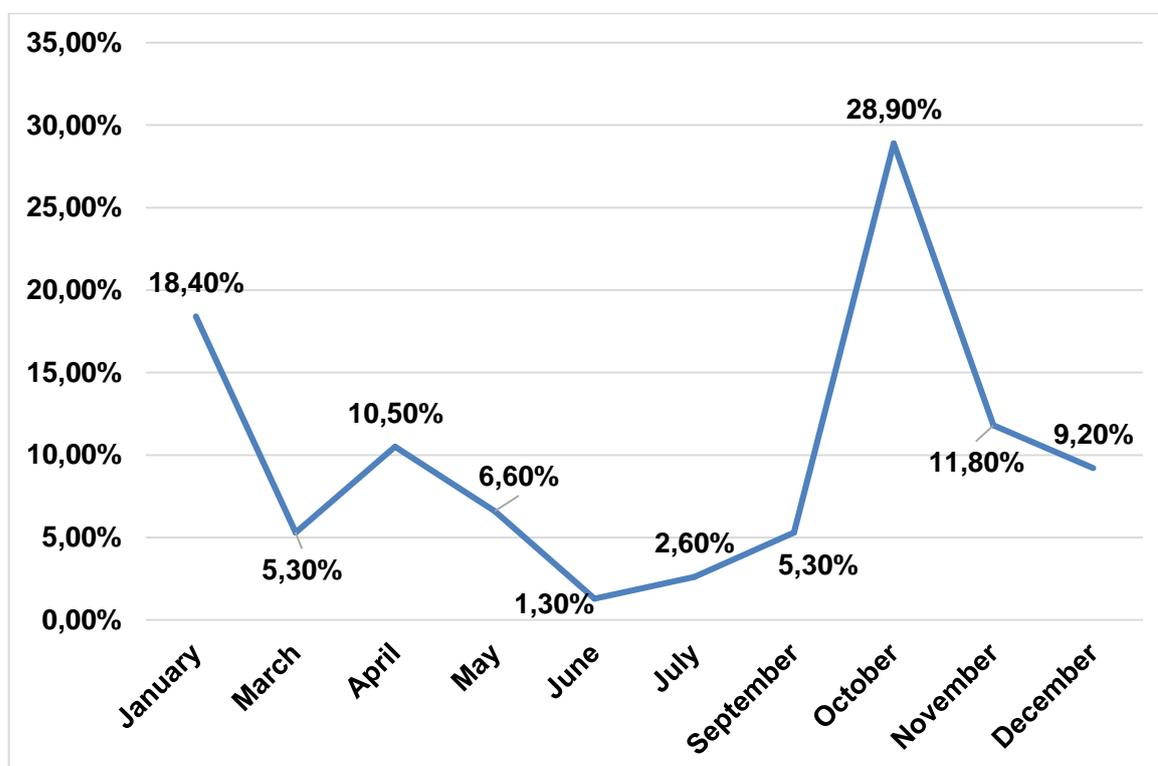


Figure 1. Distribution of number of AOM case following the time of hospitalization

Table 2. *Paraclinical characteristics of acute otitis media (n=76)*

Symptoms	No. of cases (n)	Ratio (%)
Fever	52	68.4
Otalgia	37	48.7
Otorrhea	29	38.2
Cough	54	71.1
Runny Nose	57	75.0
Headache or loss balance	1	1.3
Irritability	31	40.8
Anorectic	26	34.2

Table 3. *Characteristics of tympanic membrane (n =76)*

Tympanic membrane characteristics	No. of cases (n)	Ratio (%)
Congestive or bulging tympanic membrane	None	0
	At 1 side	18
	At both side	58
Tympanic membrane perforation	None	70
	At 1 side	6
	At both side	0
Ear purulence	None	3
	Pus stagnant	70
	Mix with blood	3

Table 4. *Characteristics of upper respiratory infection (n=76)*

Upper respiratory infection signs characteristics	No. of cases (n)	Ratio (%)
Nasal mucosa characteristics	Normal	8
	Congestion or inflammation	68
Nasal mucosa fluid	None	1
	Low level	16
	High level	59
Throat characteristics	Normal	18
	Inflammation	58

Table 5. *Paraclinical characteristics of acute otitis media (n=76)*

Paraclinical characteristics	No. of cases (n)	Ratio (%)
WBC	Normal	31
	Elevated	45
CRP	0 - 6 mg/l	40
	> 6 mg/l	36

Pus culture	Negative	15	19.7
	<i>S. pneumoniae</i>	27	35.5
	<i>H. influenzae</i>	15	19.7
	<i>S. aureus</i>	6	7.9
	<i>M. catarrhalis</i>	2	2.6
	<i>Candidas</i>	4	5.3
	<i>P. aeruginosa</i>	2	2.6
	<i>S. epidermidis</i>	5	6.6

Table 6. Distribution of treatment outcome following otorrhea symptom

Treatment result		Otorrhea		p
		Exist (n=29)	Absent (n=47)	
Respond with surgical interference		5 (17.24%)	10 (21.28%)	0.667669
Respond well with only internal medicine		24 (82.76%)	37 (78.72%)	

Remark: There is no significant difference in treatment outcomes, regardless of whether the patients have otorrhea ($p > 0.05$, Chi-square test).

Table 7. Distribution of treatment outcome following the infection of *H. influenzae*

Treatment outcome	<i>H. influenzae</i>		Absent		Total
	Exist		n	%	
Respond with surgical interference	6	40	9	60	15
Respond well with only internal medicine	9	14.75	52	85.25	61

Remark: Treatment with surgical interference was needed to be applied more frequently than monotherapy with only internal medicine in patients infected with *H. influenzae* to obtain good treatment response ($p=0.027744$; chi-square test).

DISCUSSION

Clinical, subclinical characteristics and distributions of AOM in children

General characteristics of patients

In our research, the age group with the highest prevalence of acute otitis media (AOM) in children was “6-24 months,” accounting for 58% of total cases. The “2-5 years” age group followed as the second most common, representing more than 20% of

cases. This finding aligns with Marieke L.A. de Hoog’s research, which indicated that 39% of children experienced their first AOM before the age of 2 [5]. Additionally, as noted in Van Ingen’s research, the prevalence of AOM in the population significantly increases from 2 months to 2 years of age, with another rise occurring at the school-going age of 5-6 years [6]. Except for the age group between 2 and 5 years, there are practically no changes among the other age

groups. We also found no significant differences in the percentage of AOM cases across different age groups when comparing genders. On the other hand, according to our findings, although there was no significant disproportion between the two genders in cases of AOM in children, the ratio of male patients showed a noticeable gap compared to female patients, with a rate of 1.5/1. This observation aligns with other studies that have found otitis media (OM) to be slightly more common in males than in females [7]. However, despite the increased odds of acquiring AOM for boys, gender was not associated with the overall odds of AOM [8]. In our study of 76 children with AOM at HCH, we found a significantly higher infection rate in suburban areas compared to urban areas, particularly in the top three districts: Thuy Nguyen, An Duong, and An Lao, which account for nearly half of the cases. Yin Ren's research showed that many AOM patients come from low- to medium-income households with Medicare or private insurance [9]. In contrast, Korean studies reported a higher prevalence of AOM in urban areas with high population density, though they found no significant difference [10]. Hospitalization statistics showed that most children were admitted for AOM during the winter and autumn transition, particularly from October to January. This trend aligns with data from Korea, indicating that the latter half of the year sees the highest admissions [6, 10]. Additionally, the season of birth may affect AOM rates, with studies suggesting that autumn births are linked to higher odds of developing AOM. However, literature on this relationship is contradictory; some studies support our findings, while others report lower AOM rates for autumn-born children [11]. This discrepancy may

stem from differing seasonal definitions across countries.

Clinical characteristics

- Symptoms of acute otitis media in children

Ear fluid drainage was the most common chief complaint (34%), followed by fever (29%) and ear pain (23%). While AOM is characterized by middle ear effusion and inflammation [12], some argue that ear pain is the most prominent symptom. However, ear symptoms can be subtle or absent, especially in young children [11]. Otorrhea occurred in only 38.16% of cases and can also indicate otitis externa. Thus, ear discharge should be evaluated through otoscopy to determine its source, as the presence of middle ear effusion is crucial for diagnosis.

Ear pain was reported in 48.7% of cases. AOM is the leading cause of ear pain in children, prompting many parents to seek medical help [13]. Despite being a top reason for hospitalization and emergency department visits for otologic complaints in the U.S. [14], otalgia has not yet reached 50%. This may be due to younger, non-verbal children who cannot effectively communicate their pain, often displaying irritability or passive signs of discomfort, such as loss of appetite. As mentioned, the arrangement of age groups correlates with an increase in systemic symptoms. Over one-third of patients exhibit irritability (40.8%) or reduced appetite (34.2%). While these symptoms are not specific to AOM, they are still significant. In contrast, non-specific symptoms like cough and runny nose are more prevalent, occurring in over 70% of cases (71.1% and 75%, respectively). This is expected, as upper respiratory infections (URIs) are closely linked to AOM, with 29-50% of URI cases progressing to AOM [15,

16]. AOM is an infection of the middle ear mucosa caused by bacteria or viruses entering through the Eustachian tube, often following a common cold or URI [17]. Additionally, AOM frequently arises as a complication of viral upper respiratory infections [18]. Thus, the high rate of URI symptoms aligned well with existing research.

- Signs of acute otitis media in children AOM is diagnosed clinically through symptoms and tympanic membrane (TM) examination [11]. Otoscopy is essential, especially for children with non-specific symptoms. AOM is diagnosed in symptomatic children with moderate to severe TM bulging, and can also be identified with mild bulging or intense erythema [19]. Pneumatic otoscopy has a sensitivity of 94% and specificity of 90% for detecting middle ear effusion [20]. Key diagnostic criteria include TM inflammation, intense erythema, and bulging [21]. In our study, all 76 patients had congestive or bulging TM, with 23.7% affected on one side and 76.3% on both sides. TM perforation is a significant indicator of AOM, which can complicate the clinical course [22]. In our study, TM perforation occurred in 7.9% of cases, affecting only one side. A European study found about 7% of AOM cases involved spontaneous TM perforation, with rates varying by country [22, 23]. Regarding ear purulence, only three children had no pus; 92.1% had stagnant pus, and 3.95% had a mix of pus and blood, often due to improper cotton swab use or trauma. Overall, our results indicate that suppurative AOM is more common than non-suppurative AOM. There is a strong connection between upper respiratory infections (URI) and AOM, as nearly 90% of patients showed congestive or inflammatory nasal mucosa. Nasal discharge was absent in only one child, with low-level

discharge at 21.1% and high-level discharge at 77.6%. Additionally, sore throat affected 76.3% of patients, highlighting the close relationship between URI and AOM.

Subclinical characteristics and treatment results assessment of AOM in children

Abnormal white blood cell (WBC) counts were observed in 59.2% of cases, and abnormal CRP results were found in 47.4%, both lower than the 68.4% rate of fever. We found that inflammatory marker tests do not always yield the desired results, particularly in cases of AOM in children. The widespread availability of antibiotics in pharmacies allows for early treatment, which may lead to discrepancies between inflammatory test results and clinical symptoms or improvement before hospital admission. This accessibility significantly influences symptom presentation. Our research found that *S. pneumoniae* and *H. influenzae* are the two predominant bacteria in children with AOM, followed by *S. aureus*. This aligns with Hullegie et al.'s findings, although their study focused on AOM with ear discharge [24]. Some authors report different top pathogens, including *M. catarrhalis* and *S. pyogenes*, with varying rankings [25-27]. The introduction of the heptavalent and 13-valent pneumococcal conjugate vaccines has led to *H. influenzae* replacing *S. pneumoniae* as the most common pathogen in many countries [28-30]. Regional and climatic differences may also influence bacterial environments. Some studies suggest that the risk of spontaneous perforation increases with recurrent AOM and infections caused by non-typeable *H. influenzae* [31]. However, our findings showed no difference in tympanic membrane perforation rates between infections caused by *H. influenzae* and other pathogens.

Associated factors influencing the treatment outcomes of AOM in children

While some research indicates that factors like tympanic membrane (TM) perforation, age under 2 years, and otorrhea can lead to treatment failure, we found no clear link between these risk factors and internal medicine treatment outcomes in our study. Differences in sample sizes, disease identification, early antibiotic trials, and local treatment guidelines may explain the varied results [32-34]. Overall, our findings are generally acceptable, but they may overlook the significant impact of bacteria on treatment outcomes. We observed no statistically significant difference between bacterial presence and treatment success. However, while *S. pneumoniae* appeared to have little effect, *H. influenzae* did show a notable impact. This contrasts with findings by Chen H.H. and colleagues, who reported severe consequences associated with *S. pneumoniae* [35]. Studies indicated that both *S. pneumoniae* and *H. influenzae* are increasingly resistant to antibiotics, which may complicate clinical treatment [36]. Notably, in this study, the need for surgical intervention in patients infected with *H. influenzae* was significantly higher than in those without this infection, highlighting the significant role of this bacterium in complicating AOM treatment in children.

CONCLUSIONS

Children with ear symptoms such as otorrhea or otalgia should seek prompt medical attention to prevent complications like pus accumulation in the tympanic cavity. The need for surgical intervention is increased in AOM patients infected with *H. influenzae*.

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