

Study on Evaluation and Diagnosis of the Acute Otitis Media in Children

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Abstract

Background:

Acute otitis media (AOM) is the most common childhood illness for which antibiotics are prescribed. Acute otitis media accounts for 22 % of visits to the emergency department, and has a peak incidence between 6 and 24 months of age, and is the second most common cause (after upper respiratory infection) for clinic visits among patients under 6 years of age. Bacteria are the most common etiologic agent of infections.

دراسة عن تقييم وتشخيص التهاب الأذن الوسطى الحاد عند الأطفال

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المستشفى التعليمي - الكاظمية المقدسة

بغداد

الملخص

أجريت هذه الدراسة لتقييم وتشخيص التهاب الأذن الوسطى الحاد (AOM) عند الأطفال ، مع تشخيص مسببات هذا النوع من الإصابة. تم فحص ما مجموعه ٥٢٩ طفل من المراجعين للعيادة الاستشارية للأنف والاذن والحنجرة في المستشفى التعليمي العام في مدينة الكاظمية المقدسة ، وظهر أن ١٤٤ من الأطفال الذين تتراوح أعمارهم ما بين ٦ أشهر إلى ٢ سنة يعانون من التهاب الأذن الوسطى الحاد ، منهم ٨١ ذكور (٥٦,٣ %) و ٦٣ (٤٣,٧ %) من الإناث ، أي أن معدل الإصابة في الذكور أعلى من الإناث (نسبة الذكور : الإناث = ١.٢٨ : ١.٠). وكانت الأعراض الثابتة المتمثلة بالبكاء المفرط ، صعوبة في النوم والحمى. تم عزل خمسة أنواع من البكتيريا الأكثر شيوعاً كمسببات لالتهاب الإذن الوسطى الحاد (AOM) هي : *Pseudomonas aeruginosa* (33.4 %) , *Staphylococcus aureus* (24.3 %) , *Streptococcus pneumonia* (20.1 %) , *Proteus vulgaris* (13.9 %) and *Haemophilous influenza* (8.3%). ظهر أن أعلى معدل للإصابة هو في فصل الشتاء (٤٤,٤ %) وأدناها في فصل الصيف (٨,٣ %) ، كما وجد أن الفئة العمرية (٦ – ١١) شهراً كانت أكثر عرضة للإصابة مقارنة مع غيرها من الفئات العمرية الأكبر سناً (١٨ – ٢٣) شهراً. وبخصوص اختبار حساسية البكتيريا المعزولة للمضادات الحيوية مختبرياً ، فقد أظهرت أنواع البكتيريا حساسية تجاه المضادات الحيوية نوع أمبيسلين وسيفاليكسين وجنتاميسين ومقاومة جيدة للمضادات الحيوية من نوع أموكسيسيلين وسيفوتاكسيم وتوبراميسين. بينت نتائج هذه الدراسة أنه من المهم سريريا وصف المضادات الحيوية الفاعلة لمعالجة التهاب الأذن الوسطى الحاد عند الأطفال في مثل هذه الفئات العمرية.

Aim of the study:

This study was conducted to diagnose the causal agents of acute otitis media in children, and to determine the effect of some antibiotics on the pathogens.

Patients and Methods:

A total of 529 children were screened from patients in the consultation clinic of the (E. N. T.) in Al-Kadhemia general teaching hospital, between October 2010 and May 2011, 144 of the children aged 6 months to 2 years, including 81 males of (56.3 %) and 63 females (43.7 %) , male : female ratio equal to (1.28 : 1.0) have inflammation of acute otitis media. Persistent symptoms were excessive crying, difficult sleeping and fever.

Swabs were cultured on two media by planning streaking method and incubated at 37 °C for 24 hours. Examination of the sensitivity of bacteria to antibiotics was carried out by single disc method. Six antibiotics were used in this test.

Results:

Bacteria were the most common etiologic agents of acute otitis media. The 5 most common bacteria causing acute otitis media are *Pseudomonas aeruginosa* 33.4% , *Staphylococcus aureus* 24.3% , *Streptococcus pneumonia* 20.1% , *Proteus vulgaris* 13.9% and *Haemophilous influenza*

8.3%. The infection rate was highest in the winter (44.4 %) and lowest in summer (8.3 %). Also, it was found that the age group (6 - 11) months was more vulnerable to infection as compared with other higher age groups

(18 – 23) months. Most of isolated bacteria showed a high sensitivity to the antibiotics ampicillin, cephalixin and gentamicin and a good resistance to amoxicillin, cefotaxim and tobramycin.

Conclusion:

It was found that the incidence in males is higher than in females. The results revealed that it is not sufficiently important clinically to prescribe any antibiotics to child with acute otitis media in this age groups.

Introduction

Acute otitis media (AOM) is the second most common disease for children in the age of childhood (6 - 12 months) , especially in winter, after inflammation of the upper part of the respiratory tract (1 , 2) . The incidence of this inflammation decreases gradually with age. It is known that three out of every four injured once at least in this inflammation before they become at the age of three (3). Often acute inflammation happens after colds and the recurrence of the disease in children is attributable to several reasons, also about infection after a cold or sore throat, leading to clogged of Eustachian tube and accumulation of fluid in the middle ear, which represents

an ideal condition for the growth of bacteria (4). Acute otitis media caused by a bacterial infection of the middle ear, virus or fungus also play a role (5 , 6).

Infected children complain from severe pain in the ear get, fever, difficulty in feeding, feeling unwell, nervousness and crying heavily especially at night (7). Many studies have been conducted to evaluate the effect of antibiotics on acute otitis media outcomes (8,9). Meta-analyses of randomized controlled trials comparing antibiotics versus placebo in treating acute otitis media have shown modest, if any, benefits for the clinically important outcomes of pain, fever and suppurative complications (10). The objective of this study is to isolate and diagnose the causal agents of acute otitis media in children, and to determine the sensitivity of the isolated bacteria to some drugs .

Materials and Methods

Assessment of symptoms:

To assess the acute otitis media, a scale consists of seven discrete items were used including: tugging of ears, excessive crying, irritability, difficult sleeping, diminished activity, diminished appetite, and fever (11). Symptoms were assessed with the use of a structured interview of one of the child's parents. The assessment was successfully completed with findings of otoscopic examination (12 , 13).

Samples collection:

The study was conducted between October 2010 and May 2011. A total of

144 clinical specimens were collected from children which presented acute otitis media aged between 6 months and 2 years in the consultation clinic of the (E. N. T.) , Al-Kadhemia Teaching Hospital in Baghdad province. were eligible if they were with acute otitis media . Swabs were obtained from patients suffering from a

middle ear infection after clinically diagnosed by a physician specialist ,also, information about each patient including age, gender and housing were recorded (14).

Culturing of samples:

Swabs were cultured on two media (Blood Agar and Macconkey) Agar by planning streaking method and incubated at 37 °C for 24 hours. The developing colonies was diagnosed initially relying on formal characteristics and then colored by gram stain (6).

Sensitivity of cultures to antibiotics :

Examination of the sensitivity of bacteria to antibiotics by single disc method (9). Six antibiotics , listed in the Table -1- , were used in this test. Bacterial suspensions (0.1ml) were transported and posted on the media devoted to examine the sensitivity. Then put antibiotic discs using sterile forceps, an average of 5 discs / dish so that distances were left from the edge of the dish to read the zone of inhibition. Dishes were incubated at temperature of 37 °C for 24 hours, then the diameters of inhibition zones were measured.

Table 1. The antibiotics used in the sensitivity tests.

Antibiotics	Symbol	Concentration mg / disc
Amoxicillin	AMO	25
Ampicillin	AMP	25
Cephalexin	CEP	30
Cefotaxim	CTX	30
Gentamicin	GM	30

Tobramycin	TOP	10
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Results

It was found from results in Table -2- that the incidence of acute otitis media is higher in males than in females. A total of 529 children were screened, 144 of the children have inflammation of acute otitis media, including 81 males of (56.3 %) and 63 females (43.7 %).

Table 2. Total number and percentage of infected children with AOM / gender.

Gender of Children	Number of patients	%
Male	81	56.3
Female	63	43.7
Total	144	100.0

The table -3- shows the distribution of cases of inflammation of the middle ear according to the seasons of the year. The infection rate was highest in the winter (44.4 %) and lowest in summer (8.3 %) may be due to the environmental factors which play a major role in the spread of contaminants microbial pathogens (12).

Table 3. Total number and percentage of infected children with AOM / season.

Season of Year	Number of patients	%
Winter	64	44.4
Spring	25	17.4
Summer	12	8.3
Fall	43	29.9
Total	144	100.0

It was found that the age group (6 – 11) months was more vulnerable to the disease, as compared with other higher age groups

(18 – 23 months). As children grow bigger, the angle between the Eustachian tube and the pharynx becomes more acute and so coughing or sneezing tends to push it and shut it (4). The primary outcome of persistent symptoms assessed and defined was as persistent difficult sleeping (19.4 %) , excessive crying (18.8 %) and fever (15,3 %) , as it is shown in table - 4 - .

Table 4. The presenting symptoms of diagnostic test of AOM / Age / Gender

Symptoms	Age (months) / Gender						Total	%
	6 – 11		12 – 17		18 - 23			
	Mal .	Fem .	Mal .	Fem .	Mal .	Fem .		
Tugging of ears	4	5	3	2	2	1	17	11.8
Excessive crying	7	6	4	3	4	3	27	18.8
Irritability	5	2	3	1	3	2	16	11.1
Difficult sleeping	8	5	5	4	4	2	28	19.4
Diminished activity	4	4	2	2	3	2	17	11.8

Diminished appetite	5	3	3	3	2	1	17	11.8
Fever	6	4	3	4	3	2	22	15.3
Total	39	29	23	19	21	13	144	100
%	27.9	19.3	15.9	13.2	14.6	9.1	100	

Concerning the number and type of bacterial isolates isolated from patient samples can be seen from Table - 5 - . *P. aeruginosa* is the most organism

(41.7 %), followed by *Staph. aureus* (25.2 %), then *Strept. Pneumonia*

(16.5 %) and *Proteus vulgaris* (11.7 %) and the least is *Haemophilous influenza* (4.9 %).

Table 5. Number and percentage of isolated bacteria from AOM

Isolated Bacteria	Number of Isolates	%
<i>Pseudomonas aeruginosa</i>	48	33.4
<i>Staphylococcus aureus</i>	35	24.3
<i>Streptococcus pneumoniae</i>	29	20.1
<i>Proteus vulgaris</i>	20	13.9
<i>Haemophilous influenza</i>	12	8.3
Total	144	100.0

Table -6- shows the response of bacterial isolates to six common antibiotics, the bacterial isolates showed reflecting apparently the

pattern of response to these antibiotics and through this table it is clear that *P. aeruginosa* have shown resistance to all studied antibiotics because *P. aeruginosa* has been attributed to acquire different defensive mechanisms such as production of the enzyme B-lactamase , which destroy the B-lactam ring in this types of antibiotics. This result is making the antibiotics ineffective, and may be caused by the non-arrival of resistance to antibiotic target within the bacterial cell (8,10,15,16). Also, these bacteria possess a stream systems which drag the antibiotic out of the cell. Results have shown that the effectiveness of other antibiotics is limited in this common condition and is not conclusive.

Table 6 . The response of bacterial isolates to some common antibiotics .

Antibiotics	Bacterial Isolates (No.)									
	<i>Pseud. aeruginos a (48)*</i>		<i>Staph. aureu s (35) *</i>		<i>Strep. pneumoni a (29) *</i>		<i>Proteus vulgari s (20) *</i>		<i>H. influenz a (12) *</i>	
	R	S	R	S	R	S	R	S	R	S
Amoxicilli n	3	1	4	1	3	2	2	1	2	1
Ampicillin	2	8	1	3	1	4	1	2	-	1

Cephalexin	2	9	1	6	5	4	1	3	-	2
Cefotaxim	3	2	4	2	2	1	2	1	2	-
Gentamicin	3	8	1	7	1	3	1	2	-	2
Tobramycin	4	3	4	2	2	1	2	2	2	-
Total	17	31	14	25	14	15	9	11	6	6

* number of Isolates

R / Resistant

S / Sensitive

Discussion

This study has further illustrated the importance of acute otitis media among hospitalized children of less than 2 years of age. The 3 most important predictors of acute otitis media were the age of less than 1 year, gender status and environment. These factors interact to produce a variety of acute otitis media at varying rates, and these observations are comparable to data from other studies. In this study, it was found that the incidence in males is higher than in females , this is consistent with a studies done by Bondy et al. (2000) in the United States of America , Forgie et al. (2009) in Canada who indicated that the recurrence of infection in males is higher than in females. The infection rate was highest in the winter and lowest in summer may be due to the relationship between inflammations of the upper respiratory system which is increasing during winter time such as influenza, tonsillitis and bronchitis and the accompanying complications of these is inflammation of the middle ear, this results were confirmed by Bluestone (1996) in the United States of America , Spiro and Arnold (2008) in Korea. The older children had lower

prevalence rate of acute otitis media as compared to younger children, this is consistent with the results obtained by Sarhan et al. (2012) in Iraq. In small children, the less acute angle facilitates infected material being transmitted down the tube to the middle ear (10,13).

From this study, it is concluded that acute otitis media caused by some bacterial strains which show resistance to some widespread antibiotics , the use of these antibiotics in the treatment of acute otitis media may lead to the emergence of resistant strains to these antibiotics, this is consistent with the results of Sanders et al.(2004) in Australia and Le Saux et al. (2005) in the United States of America. Also, it indicates that there are specific subgroups of children (6 – 11 and 12 – 17 months) with acute otitis media who are more likely to respond to antibiotics or benefit from antibiotic treatment.

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