

RELIABILITY OF COMBINING CLINICAL SYMPTOMS TO FACILITATE OTITIS MEDIA DIAGNOSIS IN CHILDREN UNDER 4 YEARS OF AGE

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ABSTRACT

Aim of study: The aim of the present study is to assess the profit of combination of signs and symptoms in order to increase the accuracy in diagnosing the acute otitis media in children under four years of age.

Material and method: Case-series study design was adopted for this study, based on 15% sample size of the average monthly attendance to the ear, nose, and throat department in Mosul General hospital. **Results:** A sample of 100 patients suffering from acute respiratory infections were studied, 43(43%) were females and 57(57%) were males, male to female ratio was 1.07:1. **Conclusion:** This study found that none of the clinical features were having the best validity in diagnosing acute otitis media simultaneously.

KEYWORDS: Accurate diagnosis, Otitis media, combination of symptoms.

INTRODUCTION

Acute otitis media is one of the most common problems in pediatrics, it is the most common reason for visits to pediatricians by ill children, and is the most common infection for which antibiotics agents are prescribed for children worldwide.^[1]

Acute otitis media usually arises as a complication of a preceding upper respiratory tract infections. Secretions and inflammation causes a relative occlusion of the Eustachian tubes. normally, the middle ear mucosa absorbs air in the middle ear. If air is not replaced because of relative obstruction of the Eustachian tube, a negative pressure is generated and causes a serous effusion. This effusion of the middle ear provides a fertile media for microbial growth, and, with the upper respiratory tract infections.^[2]

Introduction of upper airway viruses and/or bacteria into the middle ear may occur. If growth is rapid, the patient will have a middle ear infection. If the infection and the resultant inflammatory reaction persist, perforation of the tympanic membrane or extension into the adjacent mastoid air cells air cells may be present.^[3]

Acute otitis media accounts for 15-30 million visits to the doctor each year in the worldwide. In fact, for children 0-4 years old 17-18% of office visits are for

acute otitis media. The rate of acute otitis media has been rising over the past decades, which may be due to heredity and constitutional factors.^[4]

Some studies found that by age 12 months nearly two-thirds of all children had at least one episode of acute otitis media. By three years, 46% of children had three or more episodes of acute otitis media. Some investigations have also noted a lower peak between ages 4 and 5 years.^[5]

Acute otitis media are very common in children. In part because of concern about possible long term developmental sequelae, research into the prevention of acute otitis media has become a high priority.^[6]

MATERIAL AND METHODS

Study cases are patients under four years of age brought to Mosul general hospital at the outpatient in ear, nose, and throat department who have been diagnosed by a specialist otolaryngologist as acute otitis media, and examined by otoscopy which reveals the presence or absence of acute otitis media.

Case-series study design was adopted for this study, based on 15% sample size of the average monthly attendance to the ear, nose, and throat department in Mosul General hospital during September 2019 to end

February 2020 (n=1014). Accordingly 100 patient below four years of age with acute respiratory infections of both sexes were randomly chosen.

Patients were eligible for enrolment in the study if they were younger than four years of age, presented with respiratory symptoms, patients with cleft lip and/or palate, and Down's syndrome were excluded.

The validity of each diagnostic indicator and for a combination of clinical criteria together were estimated.

		Acute otitis media Proved by otoscopy		Total
		Present(+) <i>ve</i>	Absent (-) <i>ve</i>	
Diagnostic indicator	Present(+) <i>ve</i>	a:true (+) <i>ve</i>	b:false (+) <i>ve</i>	a+b
	Absent(-) <i>ve</i>	c: false (-) <i>ve</i>	d:true (-) <i>ve</i>	c+d
total		a+c	b+d	a+b+c+d

RESULTS

A sample of 100 patients suffering from acute respiratory infections were studied, 43(43%) were females and 57(57%) were males, male to female ratio was 1.07:1. The age range of patients was from 1 day to 48 months with main age of (18.3±13.14 months).

The current study deals with four models of combination of different symptoms of acute otitis media depending on symptoms with highest sensitivity, specificity, positive and negative predictive values, and positive and negative likelihood ratios.

The absence of two symptoms in the first model (loss of appetite and fever) simultaneously, lowered the negative likelihood ratio to (0.09) and increased the negative predictive value to (87.5%). Presence of any of these symptoms had a positive likelihood ratio of (2.5) and a positive predictive value of (41.7%). This model shows a high sensitivity (86.2%). However, it has a low specificity (54.3%).

The presence of otorrhea and loss of balance in the second model at the same time, increased the positive likelihood ratio to (20.3) and positive predictive value to (89.7%). Absence of any of these symptoms had negative likelihood ratio of (0.88) and a negative predictive value of (53.6%). This model showed an excellent specificity (99.1%), and very low sensitivity (6.9%).

The absence of the two symptoms in the third model (earache and difficult sleeping) simultaneously, lowered the negative likelihood ratio to (0.76) and increased the negative predictive value to (83.5%). This model shows a high sensitivity (82.6%). However, it has a low specificity (16.7%).

The presence of pain on lying and reduced hearing in the fourth model at the same time, increased the positive likelihood ratio to (15.8) and positive predictive value to

The Chi-squared test with Yate's continuity correction was used for statistical analysis of association between discrete variables. P values lower than 0.05 were considered significant throughout the analysis of data.

Sensitivity and specificity, positive and negative predictive values, and positive and negative likelihood ratios were estimated for each diagnostic indicator compared with the reference test results (i.e. the otoscopic finding) as follows:

(82.6%). This model showed an excellent specificity (94.2%) and a very low sensitivity (10.3%).

DISCUSSION

Acute otitis media is defined as an infection of the middle ear and is the second most common pediatric diagnosis in the emergency department following upper respiratory infections. Although it can occur at any age, but it is commonly seen between the ages of 6 to 24 months.^[7]

Symptoms of acute otitis media when considered individually were found to have a sensitivity ranging from fair to poor (6.9%-58.6%), and having inadequate positive predictive values, ranging from 17.9% to 48.5%.

The use of multiple indicators at the same time in parallel way (i.e. considering the presence of any single criterion as a positive diagnosis) increase the sensitivity and reduces the false negative diagnosis. Conversely, the use of multiple indicators in serial way (considering the absence of any indicator as a negative diagnosis) maximizes the specificity and minimizes the false positive diagnosis. To achieve this, four models of combination of clinical criteria have been tested in this study. These combinations were limited to criteria which yielded a significant association with positive otoscopic findings of acute otitis media.^[8]

The advantages of these models are being simple and less time consuming. Doctors are familiar with these easily recognized criteria in their daily practice. Moreover, assessment of children for the presence or absence of these criteria requires no further training or additional equipment other than that of routine by physicians.^[9,10]

Screening program for acute otitis media among children, can use the first model as a first step. This is more likely to detect the children with acute otitis media because it rarely misses a case. The second model used

in the next step to exclude children who are actually free from the disease because this model rarely misclassifies children without acute otitis media as diseased because it gives few false positive results.^[11,12]

CONCLUSIONS

The current study provided data on the validity of combination of signs and symptoms to increasing the accuracy of diagnosing the acute otitis media among children under 48 months of age.

The clinical criteria, which yielded a significant association with acute otitis media, when used in combinations will improve their validity in diagnosing acute otitis media among children.

This study found that none of the clinical features were having the best validity in diagnosing acute otitis media simultaneously.

The suggested these models are recommended for use in screening acute otitis media among children. The first one used primarily to detect all the children with acute otitis media, because it rarely misses a case. The next step is to apply the second model on the detected children to exclude those who are really not diseased.

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