

Assessment of Infants and Children with Symptoms Suggesting Otitis Media

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Abstract

Symptoms suggesting occurrence of otitis media (OM) in infants and young children are not always right. **Objective:** Assessment of those infants and children with symptoms suggesting otitis media. **Patients & Methods:** 113 infants and children were complaining of ear symptoms suggesting otitis media as well as 63 infants and children of same age and sex were not complaining of any of these symptoms suggesting otitis media, were fully investigated prospectively, by full clinical and ear, nose examination as well as swab culture from the ear discharge. **Results:** There was no statistical significant difference between the prevalence of otitis related symptoms and the risk factors in both groups. There was no correlation found between the otoscopic diagnosis of OM and the main complaint suggesting OM in the patients, mainly ear pain and ear discharge. There was a positive significant correlation between otoscopic diagnosis of OM and fever, diarrhea, and bronchiolitis (significance was at 0.01, 0.01 and 0.05 levels respectively). **Conclusion:** Otosopic examination is very important in any infant or child complaining of ear pain, ear discharge or complaining of otitis related symptoms.

Keywords

Symptoms, Otitis Media, Infants, Children

Subject Areas: Otorhinolaryngology, Pediatrics

1. Introduction

Otitis media (OM) challenges the clinician in a number of ways. Accurate diagnosis in infants and young children is often difficult. Symptoms may be absent or inapparent, especially in early infancy and in chronic stages of

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the disease [1].

OM is classified in two forms acute OM (AOM), an acute symptomatic disease and OM with effusion (OME), an asymptomatic disease involving fluid collection in the middle ear [2]. These two main types of otitis media are interrelated. Symptoms of AOM are variable, especially in infants and young children. In young children, evidence of ear pain may be manifested by irritability or a change in sleeping or eating habits and occasionally, holding or tugging at the ear. Fever may also be present. Rupture of the tympanic membrane with purulent otorrhea is uncommon. Systemic symptoms and symptoms associated with upper respiratory tract infections also occur; occasionally there may be no symptoms, the disease having been discovered at a routine health examination. OME often is not accompanied by overt complaints of the child but can be accompanied by hearing loss. This hearing loss may manifest as changes in speech patterns but often goes undetected if unilateral or mild in nature, especially in younger children [1]. Acute otitis media (AOM) without perforation: presence of middle ear fluid with symptoms or signs of suppurative infection, which may include otalgia, fever, irritability, vomiting or diarrhea.

AOM with perforation: acute suppurative infection with recent discharge from the middle ear or through a tympanostomy tube (within the past 7 days).

Recurrent AOM (RAOM): recurrent bouts of AOM—three episodes in 6 months or four to five in 12 months.

Chronic suppurative otitis media (CSOM): a persistent discharge from the middle ear through a tympanic membrane perforation for more than 6 weeks. The main factors that influence the risk of otitis media developing can be host-related factors e.g. young age, male gender, immune status of the patients, craniofacial abnormalities and the presence of adenoids and lack of breast feeding or environmental factors e.g. passive smoking, daycare Centre attendance. These factors primarily interact in the nasopharynx and Eustachian tube [3]. The aim of this study was assessment of the symptoms and risk factors in diagnosing OM in infants and children.

2. Patients & Methods

This study included 113 infants and children came to the pediatric and ENT clinics of Ahmad Maher Teaching Hospital complaining of ear pain or discharge (group I), their ages ranged between 3 and 84 months; 59 males and 54 females. The inclusion criteria were: age >1 and less than 120 months, ear pain and discharge were not due to external canal or skin lesion around the ear. The exclusion criteria were age <2 and >120 months, the ear complaints were due to lesions around the ear or due to trauma or surgery and craniofacial anomalies affecting the ear. 63 sex and age matched infants and children (control group) were chosen from the pediatric clinic of Ahmad Maher Teaching Hospital, not complaining of ear pain or ear discharge, but complaining of mild gastroenteritis or mild upper respiratory tract symptoms. The study was conducted in the period between September 2010 and October 2011. Written informed consent was taken from the parents or the sponsor of each patient and control after explaining the objectives of the study. The study was approved by the ethical committee of the General Organization of Teaching Hospitals & Institutes (GOTHI).

All patients and controls were subjected to:

- 1) Full history taking including:
 - a) Pain expression if it was expressed by the child's own words, or by excessive crying, or by head tugging, or by ear pulling.
 - b) Ear discharge characters whether it was purulent or serous and its color and duration.
 - c) History of previous attacks (recurrence).
 - d) Accompanying symptoms e.g. fever, upper respiratory tract symptoms, restless sleep, vomiting, diarrhea, and chest wheezes.
 - e) Type of feeding in infants.
 - f) Social history: exposure to cigarettes smoke in crowded houses and nursery attendance.
 - g) Family history of similar condition (OM).
- 2) Full clinical examination.
- 3) Otosopic examination of both ears of the patients and controls in the ENT clinic of Ahmad Maher Teaching Hospital using pneumatic otoscope Welch Allyn (Ireland). Diagnosis of AOM was fulfilled by the following criteria:
 - a) The presence of at least 2 of the following signs on the tympanic membrane: bulging position; decreased or absent mobility; abnormal color or opacity not caused by scarring; or air-fluid interfaces.
 - b) At least 1 acute inflammatory sign of tympanic membrane (distinct erythematous patches/streaks or in-

creased vascularity over full/bulging/yellow convexity), Secretory OM (OME) was diagnosed if there is middle ear fluid detected by pneumatic otoscopy [4].

4) Complete blood picture (CBC), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP).

5) Swab culture from the ear discharge.

6) Blood culture and/or urine culture according to the case.

7) Statistical analysis of the results was done using SPSS version 16 package. Percentage, mean, standard deviation (SD), independent t-student test to compare numerical means and Chi-square (X^2) test to compare ratio. Spearman's non-parametric correlation was used to correlate variables, $p < 0.05$ was considered significant.

3. Results

Out of 113 patients (group I), 97 (85.8%) cases were complaining of pain expressed by excessive crying in 45 (46.4%), head tugging and ear pulling in 18(18.6%) and the children expressed pain by their own words in 34 (35%). 26 (26.8%) of those patients, pain was accompanied by ear discharge. Ear discharge without pain was found in 28 patients out of 113 (24.8%), 11 (9.7%) was waxy discharge and 17 cases the discharge was purulent or serous, were diagnosed as chronic OM. Otitis related symptoms were present in different ratios compared to their occurrence in the control group as well as the social risk factors (Table 1). There was no statistical significant difference between the prevalence of otitis related symptoms and the risk factors in both groups. Otoscopic examination as well as other investigations done in both groups was presented in Table 2. There was no correlation found between the otoscopic diagnosis of AOM and the main complaint of the patient, mainly the pain and

Table 1. Clinical data of the studied patients and controls.

Data	Studied groups	Patients (Group I) No. = 113	Controls No. = 63	p-value
Male/Female ratio		59/54	37/26	0.7
Age, in months (m) n. (%):				
3 - 24 m		71 (62.8)	38 (60.3)	0.84
25 - 84 m		42 (37.2)	25 (39.7)	0.9
<u>Ear pain n. (%)</u> :		97 (86)		
Excessive crying n. (%)		45 (46.4)	0	0.000*
Ear tugging n. (%)		18 (18.6)		
Patient complaint		34 (35)		
<u>Ear discharge n. (%)</u>		54 (47.8)		
Purulent n. (%)		23 (20.4)	0	0.00*
Serous n. (%)		20 (17.2)		
Colored n. (%)		11 (9.7)		
Fever >38.5°C n. (%)		77 (68)	42 (66.7)	0.8
Upper respiratory tract symptoms n. (%)		73 (64)	47 (74.6)	0.5
Bronchiolitis n. (%)		13 (11.5)	16 (25.4)	0.03*
Conjunctivitis n. (%)		7 (6.2)	2 (3.2)	0.03*
Vomiting n. (%)		21 (18.6)	12 (19)	0.7
Diarrhea n. (%)		25 (22)	19 (31)	0.4
Restless sleep n. (%)		55 (48.7)	30 (47.6)	0.67
Passive smoking n. (%)		58 (51.3)	27 (43)	0.6
Day care attendance n. (%)		11 (9.7)	7 (11)	0.71
Breast feeding >3 mo. n. (%)		37(32.7)	24(38)	0.55
Family history		12(10.6)	3(4.8)	0.01*

*statistically significant.

Table 2. Otoscope examination and laboratory findings of both groups.

Investigation findings	Patients (group I) (n. = 113)	Controls (n. = 63)	p-value
Otoscope diagnosis AOM no. (%)	53 (47)	0	0.00*
OM with perforation no. (%)	43 (38)	0	0.00*
OME no. (%)	6 (5.3)	19 (30)	0.00*
Waxy discharge no. (%)	11 (9.7)	12 (19)	0.01*
Leukocytosis n. (%)	44 (39)	13 (20.6)	0.05*
Elevated acute phase reactants (ESR, CRP) n. (%)	41 (36.3)	13 (20.6)	0.06
Positive swab culture of ear discharge n. (%)	13 (11.5)	0	0.00*
Positive blood culture n. (%)	7 (6.2)	0	0.00*
Types of organisms isolated	Strept. pneumoni and proteus	0	

*statistically significant.

ear discharge, meanwhile there was a positive significant correlation between otoscopic diagnosis of AOM and fever, diarrhea, and bronchiolitis (significance was at 0.01, 0.01 and 0.05 levels respectively). Recurrent ear disease was negatively correlated with pain and occurrence of upper respiratory tract symptoms (significance was at 0.01 and 0.05 levels respectively), and positively correlated with occurrence of ear discharge (significance was at 0.01 level) **Table 3**.

4. Discussion

This study included 113 pediatric patients, their ages ranged between 3 months and 7 years, 62.8% of them were between 3 months and 2 years and 37.2% were between 2 years and 7 years, Joseph E Kershner 2011 [1] reported that OM peaks at two age groups; 6 months - 2 years and at 4 - 5 years. Male/female ratio was 59/54, Teele *et al.* 1989 [5] mentioned that OM has a higher incidence among boys due to unknown causes. These individual factors (age and sex) may be secondary to Eustachian tube size difference [6]. Family history was significantly represented in the group of patients complained of ear symptoms compared to the control group $p = 0.01$, Kvaerner *et al.* 1997 [7] concluded that heritability of otitis media susceptibility was 74% among girls and 45% among boys. Kalm *et al.* 1991 [8] mentioned that genetic factors may play a role in susceptibility to OM, HLA-A2 gene has been noted to be with R AOM, but not OME. RAOM was found in 3.5% of the patients group in our study and was noted to be associated significantly with ear discharge ($p = 0.000$) and significantly negatively correlated with ear pain ($p = 0.000$); this observation could be explained by what is mentioned by Smith *et al.* 2010 [9], that ear discharge may define a group of children who have severe disease and more adverse outcome.

Ear pain in our patient's group was expressed by parent's words in the form of ear tugging and excessive crying in 65% of cases, but interpretation of these symptoms may be influenced by the socioeconomic status [10], so ear pain and ear discharge which were the most significant symptoms of our group of patients, were not significantly correlated with otoscopic diagnosis of OM. OME was found by otoscopic examination in 30% of the control group compared 5.3% in the patient's group ($p = 0.001$), this result agreed with that of Kiris *et al.* 2012 [11].

Otoscope OM was significantly correlated with fever and diarrhea at 0.01 level, a result which was against that of Laine *et al.* 2010 [4], who found that no symptoms whether fever or gastrointestinal can predict AOM. 60% of the episodes of upper respiratory catarrh among young children were complicated by AOM [2], in our study otoscopic diagnosis of AOM did not correlated significantly with the occurrence of upper respiratory symptoms.

Bacterial organisms isolated from the ear discharge in our patients; were streptococci and proteus, were isolated from only 13 out of 54 (24%). Streptococci were the commonest organisms isolated from cases of OM, others were found in the study of Pettigrew *et al.* 2012 [12] e.g. Hemophilus influenza and Moraxella Catarrhalis. Other cases, the result of cultures was no growth, in these cases viral causes were suspected as was mentioned by Tasnee *et al.* 2008 [2]. Among these viruses was Respiratory Syncytial virus [13], who mentioned also

Table 3. Non-parametric Spearman's correlation.

	Pain	Ear discharge	Fever	Urt symptoms	Bronchiol	Vomiting	Diarrhea	Recurrent similar ear condition	Otosopic OM
Pain correlation coefficient		-0.459**	-0.088	0.055	0.067	-0.185*	-0.067	-0.334**	0.050
Sig. (2-tailed)	1	0.000	0.352	0.561	0.480	0.050	0.481	0.000	0.596
N	113	113	113	113	113	113	113	113	113
Ear discharge correlation coefficient	0.459**	1	0.211*	-0.150	-0.079	0.110	0.240*	0.401**	0.013
Sig. (2-tailed)	0.000	1	0.025	0.112	0.406	0.247	0.011	0.000	0.888
N	113	113	113	113	113	113	113	113	113
Otosopic OM correlation coefficient	0.050	0.013	0.298**	-0.103	0.231*	0.038	0.303**	0.061	1.000
Sig. (2-tailed)	0.596	0.888	0.002	0.278	0.014	0.687	0.001	0.519	1.000
N	113	113	113	113	113	113	113	113	113
Fever correlation coefficient	-0.088	0.211*	1	-0.033	-0.108	0.364**	0.259**	0.042	0.28**
Sig. (2-tailed)	0.352	0.025	1	0.727	0.255	0.000	0.006	0.661	0.002
N	113	113	113	113	113	113	113	113	113
Urt symptoms correlation coefficient	0.055	-0.150	-0.033	1	0.127	0.054	-0.056	-0.249**	-0.103
Sig. (2-tailed)	0.561	0.112	0.727	1	0.180	0.567	0.554	0.008	0.278
N	113	113	113	113	113	113	113	113	113
Restless sleep correlation coefficient	-0.037	-0.026	0.068	0.041	-0.86	0.182	0.086	-0.099	0.096
Sig. (2-tailed)	0.695	0.695	0.476	0.665	0.366	0.054	0.367	0.294	0.300
N	113	113	113	113	113	113	113	113	113
Vomiting correlation coefficient	-0.185*	0.110	0.364**	0.054	-0.081	1	0.445**	-0.094	0.038
Sig. (2-tailed)	0.050	0.247	0.000	0.567	0.393	1	0.000	0.321	0.687
N	113	113	113	113	113	113	113	113	113
Diarrhia correlation coefficient	-0.067	0.240*	0.259**	-0.056	-0.079	0.445**	1	0.155	0.303**
Sig. (2-tailed)	0.481	0.011	0.006	0.554	0.409	0.000	1	0.102	0.001
N	113	113	113	113	113	113	113	113	113
Brochiolitis correlation coefficient	0.067	-0.079	-0.108	0.127	1	-0.081	-0.079	-0.032	-0.231
Sig. (2-tailed)	0.480	0.406	0.255	0.180	1	0.393	0.409	0.739	0.014
N	113	113	113	113	113	113	113	113	113
Conjunctivitis correlation coefficient	0.104	-0.123	-0.194*	0.046	-0.042	0.059	0.066	-0.049	-0.040

Continued

Sig. (2-tailed)	0.271	0.195	0.040	0.631	0.655	0.534	0.486	0.605	0.673
N	113	113	113	113	113	113	113	113	113
Exposure to cigarette smoke correlation coefficient	-0.047	-0.163	-0.179	0.263**	0.164	0.183	0.027	-0.097	0.111
Sig. (2-tailed)	0.620	0.084	0.059	0.005	0.083	0.052	0.777	0.304	0.241
N	113	113	113	113	113	113	113	113	113

*Significant at 0.05 level; **Significant at 0.1 level.

that passive smoking was far more common among parents of those patients with viral OM. Respiratory Syncytial virus is the commonest cause of bronchiolitis in infants, otoscopic diagnosis of OM in our study was significantly correlated with cases of bronchiolitis at the level 0.05.

In our study there was no significant correlation between upper respiratory tract infection and otoscopic diagnosis of otitis media, but there was a statistically significant correlation between upper respiratory tract infection and exposure to cigarette smoke (CS) at the level of 0.01, an observation confirmed by Pirogowicz *et al.* 2004 [14]. Bradley *et al.* 2005 [15] reported that in infants, CS exposure is associated with increased incidence of severe cases of respiratory syncytial virus induced bronchiolitis with lower O₂ saturation than unexposed infants. Usually bronchiolitis follows attach of upper respiratory tract infection, as well as the occurrence of AOM, this may explain our findings (the significant correlation between otoscopic diagnosis of OM and bronchiolitis but not the upper respiratory tract catarrh).

5. Recommendation

- 1) Otosopic examination is recommended for any infant or child complaining of any ear complaint before prescribing any antibiotics.
- 2) Otosopic examination is recommended in any infant or child with fever, diarrhea or bronchiolitis.

6. Summary

- Ear pain and ear discharge are the most common symptoms leading parents to ask for treatment of otitis media in their infants or children.
- The present study was done on 113 pediatric patients complaining of ear pain or ear discharge or both (group I), as well as 63 patients of same age and sex distribution, not complaining of either ear pain or ear discharge [control group].
- Out of 113 patients, 97 (85.8%) cases were complaining of pain. 26 (26.8%) of those patients, pain was accompanied by ear discharge. Ear discharge without pain was found in 28 patients out of 113 (24.8%), [11 (9.7%) was waxy discharge] and 17 cases the discharge was serous or purulent were diagnosed as chronic OM.
- AOM was diagnosed in 47% of group I, and OM with perforation in 38%. And OM with effusion in 5%.
- 30% of the control group was diagnosed by otoscopic examination as OM with effusion.
- There was no statistical significant difference between the prevalence of otitis related symptoms and the risk factors in both groups.
- There was no correlation found between the otoscopic diagnosis of OM and the main complaint of the patient, mainly the pain and ear discharge.
- There was a positive significant correlation between otoscopic diagnosis of AOM and fever, diarrhea, and bronchiolitis (significance was at 0.01, 0.01 and 0.05 levels respectively).
- Recurrent ear disease was negatively correlated with pain and occurrence of upper respiratory tract symptoms (significance was at 0.01 and 0.05 levels respectively), and positively correlated with occurrence of ear discharge (significance was at 0.01 level).
- Otosopic examination is recommended for any infant or child complaining of any ear complaint before prescribing any antibiotics.

References

- [1] Kershner, J.E. (2011) Otitis Media. 19th Edition, Chapter 632 in Nelson Textbook of Pediatrics, Elsevier Saunders, Philadelphia.
- [2] Chonmaitree, T., Revai, K., Grady, J.J., Clos, A., Patel, J.A., et al. (2008) Viral Upper Respiratory Tract Infection and Otitis Media Complication in Young Children. *Clinical Infectious Diseases*, **46**, 815-823.
- [3] Kong, K. and Coates, H.L.C. (2009) Natural History, Definitions, Risk Factors and Burden of Otitis Media. *The Medical Journal of Australia*, **191**, 39.
- [4] Laine, M.K., Tahtinen, P.A., Ruuskanen, O., Huovinen, P. and RuohoIa, A. (2010) Symptoms or Symptom-Based Scores Cannot Predict Acute Otitis Media at Otitis-Prone Age. *Pediatrics*, **125**, e1154-e1161.
- [5] Teele, D.W., Klein, J.O. and Rosner, B. (1989) Epidemiology of Otitis Media during the First Seven Years of Life in Children in Greater Boston: A Prospective, Cohort Study. *The Journal of Infectious Diseases*, **160**, 83-94. <http://dx.doi.org/10.1093/infdis/160.1.83>
- [6] Doyle, W.J. (1977) A Functional-Anatomic Description of Eustachian Tube Vector Relations in Four Ethnic Populations: An Osteologic Study. Ph.D. Dissertation, University of Pittsburgh, Pittsburgh.
- [7] Kvaerner, K.J., Harris, J.R., Tambs, K., et al. (1997) Distribution and Heritability of Recurrent Ear Infections. *Annals of Otolaryngology, Rhinology, and Laryngology*, **106**, 624-632.
- [8] Kalm, O., Johnson, U., Preliner, K. and Ninn, K. (1991) HLA Frequency in Patients with Recurrent Acute Otitis Media. *Archives of Otolaryngology—Head and Neck Surgery*, **117**, 1296-1299. <http://dx.doi.org/10.1001/archotol.1991.01870230112019>
- [9] Smith, L., Ewings, P., Smith, C., Thompson, M., Harnden, A. and Mant, D. (2010) Ear Discharge in Children Presenting with Acute Otitis Media: Observational Study from UK General Practice. *British Journal of General Practice*, **60**, 101-105. <http://dx.doi.org/10.3399/bjgp10X483148>
- [10] Shaikh, N., Kearney, D.H., Colborn, D.K., Balentine, T., Feng, W., Lin, Y. and Hoberman, A. (2010) How Do Parents of Preverbal Children with Acute Otitis Media Determine How Much Ear Pain Their Child Is Having? *Journal of Pain*, **11**, 1291-1294. <http://dx.doi.org/10.1016/j.jpain.2010.03.017>
- [11] Kiris, M., Muderris, T., Kara, T., Bercin, S., Cankaya, H. and Sevil, E. (2012) Prevalence and Risk Factors of Otitis Media with Effusion in School Children in Eastern Anatolia. *International Journal of Pediatric Otorhinolaryngology*, **76**, 1030-1035. <http://dx.doi.org/10.1016/j.ijporl.2012.03.027>
- [12] Pettigrew, M.M., Laufer, A.S., Gent, J.F., Kong, Y., Fennie, K.P. and Metlay, J.P. (2012) Upper Respiratory Tract Microbial Communities, Acute Otitis Media Pathogens, and Antibiotic Use in Healthy and Sick Children. *Applied and Environmental Microbiology*, **78**, 6262-6270. <http://dx.doi.org/10.1128/AEM.01051-12>
- [13] Kristjánsson, S., Skúladóttir, H.E., Sturludóttir, M. and Wennergren, G. (2010) Increased Prevalence of Otitis Media Following Respiratory Syncytial Virus Infection. *Acta Paediatrica*, **99**, 867-870. <http://dx.doi.org/10.1111/j.1651-2227.2009.01637.x>
- [14] Pirogowicz, I., Bujnowska-Fedak, M., Piorek, M. and Steciwko, A. (2004) Effect of Passive Cigarette Smoking on the Frequency of Respiratory Tract Infections, Allergy and Bronchial Asthma in Children. *Przegląd Lekarski Journal*, **61**, 1061-1064.
- [15] Bradley, J.P., Bacharier, L.B., Bonfiglio, J., et al. (2005) Severity of Respiratorysyncytial Virus Bronchiolitis Is Affected by Cigarette Smoke Exposure and Atopy. *Pediatrics*, **115**, e7-e14.