



Abstract

Etiologic Causes of Otitis Media with Effusion in Children

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Introduction: Otitis media with effusion (OME) is one of the most common diseases in childhood. It is the most common reason of acquired hearing loss in pre-school childhood. We aimed to draw attention to the importance of diagnosing OME by otoscopic and tympanometric examination in early eras and to determine the risk factors in our cases.

Methods: The present study was conducted in our hospital with a total of 31 OME children between the ages of 8 months and 6 years who were followed by the children's and otorhinolaryngology clinics between 2013 and 2014. The etiologic factors in patients who were detected with effusion by otoscopic and tympanometric examination were documented.

Results: A total of 350 children were evaluated between the ages of 8 months and 6 years. Of the total, only 31 children (8.8%) were diagnosed with OME. The mean age of children was 27.1 ± 16.9 months. Seventeen patients (54.8%) were males, and 14 patients (45%) were females. Twenty-nine had bilateral OME. Type B tympanogram curves were found in 54 (90%), and type C2 curves were found in 6 (10%) of all patients. The sensitivity of the skin prick test was found in 33.3% for one or more allergens. The skin prick test was positive in all cases in which eosinophil cationic protein levels were considered significantly positive. The adenoid tissue was larger than normal sizes in 13 (43.3%) patients.

Conclusion: OME is a serious public health problem with leading conductive type hearing loss, retardation of speech, and developmental speech and language problems. Therefore, otoscopic examination is crucial in children in all hospital admissions for any reasons.

Keywords: Otitis media with effusion, child, etiology

Introduction

Effusion otitis media (EOM) is a disease characterized by the accumulation of fluid behind the intact tympanic membrane, without signs and symptoms of local and general infection. It is the most common cause of acquired hearing loss in pre-school childhood. The prevalence of EOM in the world ranges from 2.2% to 31.3% (1). Hearing loss developing in early childhood can lead to irreversible sequels that may last for a lifetime by affecting the speech, language, and social relationships of the child. By drawing attention to the necessity of early diagnosis in patients with EOM through an otoscopic and tympanometric examination, the aim of this study is to reveal the etiologic factors in our cases.

Methods

This study was conducted in 31 children with EOM aged between 8 months and 6 years, who were followed up in the Fatih Sultan Mehmet Training and Research Hospital Pediatric and Otorhinolaryngology (ENT) clinics between the years of 2013 and 2014. Those with cleft palate-lip, neurological diseases, tumors, and hypothyroidism were excluded from the study. A total of 350 children who consulted to the pediatric polyclinic for other complaints were evaluated, and EOM was found in 31 of them. The patients in whom effusion was detected through an otoscopic and tympanometric examination were observed for 3 months, and those in whom the symptoms continued were diagnosed with EOM. A detailed anamnesis was taken from the patients, and allergy and adenoid findings were examined. In addition, their ears were thoroughly evaluated by the same otolaryngologist with an operating microscope. The collapse of the eardrum, opacity, opaque or yellowish-white color, the loss of light triangle and deformity, retraction and increase in capillary vessels, and the presence of fluid level or bubbles were assessed as EOM in these evaluations. Bilateral tympanograms of all cases were obtained (Impedance audiometer AT235h; Interacoustics, Assens, Denmark), and the measurements were recorded as the types A, B, and C, using a modified Jerger classification (2). A total blood analysis, eosinophil count, immunoglobulins, total IgE and allergen-specific IgE, eosinophilic cationic protein (ECP), and eosinophil in the nasal smear were studied in the cases. The normal limits of immunoglobulins according to age were taken into consideration. Adenoid assessment was also performed endoscopically by

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the ENT specialist (Storz endoscopy device, Karl Storz, Germany). The skin prick test was performed in patients when required. The endurance above 3 mm was considered significant. For this study, the parents of the patients were informed, their written informed consents were received, and the study was approved by the ethics committee of our hospital.

Statistical Analysis

Statistical analyses of the cases were made using the SPSS (Statistical Package for Social Sciences) Version 15.0 (SPSS Inc.; Chicago, IL, USA) software. The statistical analysis of the data was performed using the chi-squared test. The value of $p < 0.05$ was considered significant.

Results

In this study, a total of 350 children aged between 8 months and 6 years were evaluated, and EOM was detected in 31 of them. The frequency was found at 8.8%. The mean age of the cases was calculated as 27.1 ± 16.9 months. There were 17 (54.8%) boys and 14 (45%) girls. The mean age of the boys and girls was 30.9 ± 16.7 months and 23.9 ± 16.8 months, respectively. There was no difference between the average age of boys and girls. The age distribution of the patients is given in Table 1.

Because a perforation was detected in the eardrum of 1 of the 31 patients accepted to have EOM, this patient was excluded from the study. Bilateral EOM was detected in 29 of the patients. Type C2 tympanogram curve was detected in 6 (10%) of 60 ears in total, and type B tympanogram curve was detected 54 cases (90%). The risk factors of the cases are given in Table 2.

When we examined the skin prick tests, we found susceptibility to one or more allergens in 10 (33%) of the cases. The most frequently detected susceptibility was observed against house dust mites in 6 cases. The ECP level was over 24 ng/mL in 10 cases (33.3%). In all these cases, the skin prick test was positive. In a total of 13 cases (43.3%), adenoid tissue was found to be large, and the skin prick test and the ECP level were high in 6 of them. In the peripheral smear examination, eosinophils were detected above 4% (average 8.1%) in 8 cases (26.6%), and sensitization was detected in 5 of them. The serum total IgE level was found to be elevated in 11 (36.6%) patients for their age. None of the patients had low levels of other immunoglobulins. In nasal smear, eosinophilia was detected at over 10% in 4 patients (13.3%) and over 5% in 2 patients (6.6%).

Discussion

Effusion otitis media is one of the most common childhood diseases and is defined as the accumulation of fluid in the middle

ear cavity that lasts longer than 3 months. Every year in the United States, more than 2.2 million cases are diagnosed, and it is the most common cause for referral to surgery (3). Eighty percent of the children have at least one EOM episode within the first 10 years of life, and it is most commonly seen in children between 6 months and 4 years of age. Most of the EOMs recover spontaneously within 3 months, but 30%-40% of children have recurrent attacks, and they last more than a year in 5%-10% of these cases. It was observed that its frequency gradually decreased after 7 years of age (3-5). Our cases were in this interval, which was the most common age group. The mean age of the patients was 27.1 months; we accepted the cases lasting longer than 3 months as EOM and investigated the etiologic factors. EOM is very common in young children. The prevalence of EOM was found to be 6.8% in a study recently conducted in the age group of 6-12 years in our country. No difference was found between the genders in this study, which is in compliance with our study (6). In the study by Kiriş et al. (7), a rate of 10.4% (in 2355 children aged between 6 and 11) was found. In a study conducted in Brazil in 2015, EOM was found in about one-third of children younger than 1 year, and it was mostly associated with artificial nutrition (8). But there is a need for further studies to be conducted on its frequency in small children. The younger the child is, the greater the rate of bilateral EOM is. In this study, bilateral EOM was found in 29 cases. However, the younger child, the more difficult it gets to assess the hearing. In many cases in young children, EOM is actually detected incidentally during a general examination. For this reason, otoscopic examinations of outpatients at this age are of great importance.

It has been observed in the literature that type B tympanograms detect the presence of effusion in the middle ear at a rate higher than 90%. It has also been reported that type C2 tympanograms

Table 1. Age distribution of the patients with effusion otitis media

Age (years)	n	(%)
0-1	9	(29.2)
1-2	8	(25.8)
2-3	7	(22.5)
3-4	5	(16.1)
5-6	2	(6.4)

Table 2. Distribution of some risk factors that increase effusion otitis media

Factors		(n)	(%)
Attending day care center	Attending	18	58.1
	Not attending	13	41.9
Number of people in the family	3 and fewer	10	32.4
	4	14	45.1
	5 and more	7	22.5
Smoking	Yes	20	64.5
	No	11	35.5
Breastmilk (over 5 months)	received	29	93.5
	not received	2	6.5
Atopy story in family	Yes	26	83.9
	No	5	16.1
Otitis history	Yes	21	67.7
	No	10	32.3
Number of annual URTDs	1-2	3	9.6
	3-4	14	45.2
	5 and more	14	45.2
Birth weight	Below 2500 gr	4	12.9
	Over 2500 gr	27	87.1
URTD: upper respiratory tract diseases			

indicate the presence of effusion at a rate of 65% and show tube dysfunction (9, 10). Consistent with the literature, type B tympanogram was found in 90% of the patients in our study. The fact that the Eustachian tubes of babies are small-calibrated and shorter provides the basis for an increased Eustachian tube dysfunction and infection risk (11). Respiratory tract infections, adenoid vegetation or craniofacial malformations, nasopharyngeal mechanical obstruction, allergies, and immunological factors have been suggested as the major etiologic factors in the pathogenesis of EOM. The pathogenic mechanism of EOM is not clear. However, the Eustachian tube dysfunction and development of negative pressure in the middle ear are the most important risk factors for this disease (12, 13). In this study, adenoid vegetation (43.3%) and allergy (33.3%) were the most commonly found conditions. Becker et al. (14) reported in their study that the allergic background was between 20% and 30% in EOM.

According to many theories, it is thought that the Eustachian tube dysfunction may be caused by internal or external obstruction developing due to allergy or infection. These functional abnormalities may be related to impaired mucociliary activity and to the aspiration of bacteria from the Eustachian tube. *Streptococcus pneumoniae*, *Haemophilus influenza*, and *Moraxella catarrhalis* are the most common pathogenic microorganisms causing EOM (15-17). Therefore, beta-lactamase-resistant antibiotics are used in EOM nowadays. We also applied a cure of antibiotics in our patients after the diagnosis.

Furthermore, race, gender, climatic conditions, environment, humidity level, socioeconomic status, breastfeeding period, living in a crowded house, attending a daycare center, passive smoking, and gastroesophageal reflux are suggested as the additional factors in EOM (6, 18, 19). In another study examining the EOM the risk factors, smoking parents, a recent history of acute otitis media and upper respiratory tract infection, socioeconomic status, family size, parental education level, and history of breastfeeding were found to be statistically significant factors (6). In our study, we have also found similar factors in accordance with these data.

Antibiotics, nasal steroids, antihistamines, and surgical approaches are currently applied for the treatment of EOM according to the condition of the patient. Adenoidectomy and/or ventilation tube administration is an effective method for reducing morbidity in recurrent EOM, especially in children aged between 4 and 8 years (19, 20). In the study conducted with children aged between 6-14 years, El-Anwar et al. (2) found that nasal steroid administration caused a significantly higher improvement in EOM than placebo. There are data in Cochrane, as well, regarding the efficacy of nasal steroids (21). Two studies from the United States and the United Kingdom have shown that the balloon inflation therapy has very good results as the first step, especially in children who are at school age and have EOM (22, 23). We also favor such non-invasive therapies to be tested. In this study, 22 patients (70.9%) benefited from the medical treatment. Surgical procedures were applied in the remaining patients.

Conclusion

Effusion otitis media is a serious public health problem. EOM in childhood does not only lead to frequent use of health services, but it also causes transmission-type hearing loss, a delay in speech

and language development, and chronic ear problems (6, 24). The morbidity, complications, and sequelae of the disease can be prevented by early diagnosis and emergency treatment. Early diagnosis is not always possible because the disease is covert and usually seen in small children. For this reason, it is very important to perform an absolute otoscopic examination to prevent the occurrence of EOM and to make an appropriate treatment plan, especially for children with the risk factors although they come with other complaints.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Fatih Sultan Mehmet Training and Research Hospital (FSM/2017_13).

Informed Consent: Informed consent is obtained from the parents of the patients who participated in this study.

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