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Prevalence and risk factors of otitis media with effusion in primary school children in Mersin

Mersin'de ilkokul çocuklarında efüzyonlu otitis media prevalansı ve risk faktörleri

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ABSTRACT

Aim: To investigate the prevalence of otitis media with effusion (OME) and related risk factors among primary school children in Mersin.

Material and Method: The study was conducted at eight primary government schools in the distinct socioeconomic district between October 2018 and December 2018. Using the combined physical examination and otoscopic evaluations, a total of 960 children included the study.

Findings: Of the children who were screened, 53.2% were girls and the mean age was 7.57±0.45 years (min:5-max:11 years). In this study, otitis media with effusion prevalence was 2.6% (20 of 761 children) and all children had bilateral otitis media with effusion. There was no statistically significant difference between the presence of otitis media with effusion and the number of people at home, incoming level, month of birth, birth weight, duration of breastfeeding, age average, class, gender, smoking in the house, presence of hearing loss in the family, history of otitis in the family, use of pacifier, use of baby bottle, presence of allergy, previous history of otitis, the presence of open mouth, snoring and tonsil grades.

Conclusion: Although the low prevalence of otitis media with effusion in our study, considering that otitis media with effusion and its possible preventive severe complications, screening for otitis media with effusion should be a part of preventive health services, particularly for primary school children.

Keywords: Children, school nursing, otitis media with effusion, prevalence, primary schools

ÖZ

Amaç: Mersin'deki ilkokul çocukları arasında efüzyonlu otitis media (EOM) prevelansını ve ilgili risk faktörlerini araştırmak.

Gereç ve Yöntem: Çalışma Ekim 2018-Aralık 2018 tarihleri arasında farklı sosyoekonomik bölgedeki sekiz ilköğretim okulunda gerçekleştirildi. Fizik muayene ve otoskopik değerlendirmeler birlikte kullanılarak toplam 960 çocuk çalışmaya dahil edildi.

Bulgular: Tarama yapılan çocukların %53,2'si kız ve ortalama yaş 7,57±0,45 yıl idi (min:5-max:11 yıl). Bu çalışmada efüzyonlu otitis media prevalansı %2,6 idi (761 çocuğun 20'si) ve tüm çocuklarda bilateral efüzyonlu otitis media vardı. efüzyonlu otitis media varlığı ile evdeki kişi sayısı, gelir düzeyi, doğum ayı, doğum kilosu, emzirme süresi, yaş ortalaması, sınıf, cinsiyet, evde sigara kullanımı, ailede işitme kaybı varlığı, ailede otit öyküsü, emzik kullanımı, biberon kullanımı, alerji varlığı, önceki otit öyküsü, açık ağız varlığı, horlama ve bademcik evreleri arasında istatistiksel olarak anlamlı bir fark yoktu.

Sonuç: Çalışmamızda efüzyonlu otitis media prevalansı düşük olmasına rağmen, efüzyonlu otitis media ve olası önleyici ciddi komplikasyonları düşünüldüğünde, efüzyonlu otitis media taraması özellikle ilkokul çocukları için koruyucu sağlık hizmetlerinin bir parçası olmalıdır.

Anahtar Kelimeler: Çocuklar, hemşirelik, efüzyonlu otitis media, prevalans, ilkokul

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INTRODUCTION

Hearing loss in childhood occurring from birth to late childhood and it can be classified as conductive, sensorineural and mixed type. The signs of hearing loss include delays in speech or language, vestibular problems and academic failure in children. Also hearing loss can affect children's social interactions and academic life (1,2). Early diagnosis of hearing loss is essential for warranting early intervention and development of normal language and academic skills in children. For this reason, hearing screening and ear examination are important in school-age children and appropriate follow-up care should be provided to detected children (3,4).

Otitis media with effusion (OME) is defined as the accumulation of fluid in the middle ear cavity without any signs and symptoms of acute infection and it causes conductive type hearing loss. Hearing loss in children is most commonly related to OME in developed countries. Hearing loss may affect speech, cognitive, and psychological development of the children. Since OME symptoms can be insidious, diagnosis is difficult and often delayed. The disease is an important public health problem because there are many risks of complications such as tympanosclerosis, chronic otitis media (COME), retraction pockets and adhesive otitis media (5). There are many environmental risk factors including smoking, poor socio-economic conditions, seasonal conditions, daycare, race, sex, adenoid tissue hypertrophy, eustachian tube dysfunction, immunodeficiency, allergy, mastoid pneumatization and craniofacial abnormalities in the development of OME. Epidemiologic data may be contributory and complementary in determining the etiopathogenesis of OME. There are several studies reported the prevalence of OME as 1.3 to 31.3% in primary school children depending on the countries (2,6-8).

The school health nurse serves an important role in the overall health and education of the children in their school and hearing screening in school-age children is a part of this role. Handling hearing loss early offers better results and an opportunity for success at school. Since the most common cause of conductive hearing loss in children is OME, it is an important health problem in school-age children (9). With this viewpoint, the study aimed to determine the prevalence of OME in primary school children in Mersin and to investigate the association between OME and related risk factors.

MATERIAL AND METHOD

Patient Selection

This cross-sectional study was conducted by Department of Public Health Nursing and Otorhinolaryngology between October 2018 and December 2018. This study was approved by the Ethics Committee of Mersin University. There were approximately 120000 children in 139 primary schools covering the first four years of education. The minimum number of samples (768) was calculated by statistical software (Epi-Info version 7; www.cdc.gov). The population of the universe was 120000 and the prevalence of OME was 10%, 95% confidence interval, 3% sampling error and design effect as 2. A total of 960 students sampled due to predict of 20% loss. In this study, multistage sampling method was used. Each district was evaluated as a cluster and location of schools divided to a low, medium and high level according to land price of districts. Each school was selected from each district on low and high socioeconomic level (among the lowest and highest of 20% segment) by simple random sampling method. One class was determined with randomly from each first, second, third and fourth's class on each school. There were 960 students in 32 classes in eight schools included in the study and 761 students receiving parental consent were included in the study. The participation rate was 79.3%.

Questionnaire

In this study, data collected with middle ear disorders risk factors questionnaire and physical examination findings. Twenty-one questions included in this questionnaire which includes the child's health status, breastfeeding, bottle-pacifier use, number of individuals living at home, smoking in the house, family ear disease history accordance with the literature (6-8). The questionnaire and the parental leave form were sent to the families by the school nurse the day before the examination. Children of the families were examined who signed the informed consent form and completed the form.

Examination

All the children were examined in the suitable place of each school by otorhinolaryngology specialist. Physical examination was carried out by otoscope (ear and nasal examination) and abeslang (oral cavity examination). Children with obstructed external ear canal by cerumen excluded from the study. The ear examination findings divided as normal ear, OME, COME and adhesive otitis media. Oral cavity examination findings divided as tonsillar hypertrophy, according to Brodsky (from grade 0 to grade 4). The children diagnosed as OME were referred to the hospital for follow-up and treatment.

Statistical Analysis

The data were analyzed by E-Picos (Medicres.org) using descriptive statistics as number, percentage, arithmetic mean, median (25%-75%) and materiality test as Chi-square test. $p \leq 0.05$ was considered significant.

RESULTS

In this study, 45.9% of the schools with low socioeconomic status, and 54.1% of with high socioeconomic status. According to classes of students, 26.3% of the students were 1st grade, 23.8% were 2nd grade, 22.5% were 3rd grade and 27.5% were 4th grade (**Table 1**).

Table 1. Introductory features of children

		n	%
Location of schools according to incoming level	Low	349	45.9
	High	412	54.1
Class	1. class	200	26.3
	2. class	181	23.8
	3. class	171	22.5
	4. class	209	27.5
Sex	Female	405	53.2
	Male	356	46.8

Of the children who were screened, 53.2% were girls and the mean age was 7.57±0.45 years (min: 5-max: 11 years). The average of income level of family (n=578) 2334.82±67.172 TL (min: 60-max: 13000 TL). The average number of people living at home (n=723) 4.90±0.06 (min: 2-max: 12 person). The average birth weight of the children (n=710) 3198.50±23.18 gr (min: 800-max: 6000, median: 3200 gr) and average breastfeeding time (n=615) 15.63±0.36 months (min: 1, max: 48, median: 15 months).

In this study, OME prevalence was 2,6% (20 of 761) and all children had a bilateral OME. Also, one child had bilateral perforated tympanic membrane (0.1%) and six children had a retraction of the tympanic membrane (1.5%) (**Table 2**).

Table 2. Examination findings of children

Examination finding		n	%
Otoscopic examination (n:761)	Normal	698	91.8
	Pathologic	27	3.5
	Could not be assessed	36	4.7
Otitis media with effusion (n:725)	Yes	20	2.7
Perforated tympanic membrane (n:725)	Yes	1	0.1
Retraction of tympanic membrane (n:725)	Yes	6	0.8
Tonsillar size (n:761)	Grade-0	172	22.6
	Grade-1	328	43.2
	Grade-2	183	24.0
	Grade-3	49	6.4
	Grade-4	3	0.4
	Tonsillectomised	26	3.4

There was no significant difference between the presence of OME and the number of people at home, the amount of income, month of birth, birth weight, duration of breastfeeding, age average, income status, class, gender, smoking in the house, presence of hearing loss in the family, history of otitis in the family, use of pacifier, use of baby bottle, presence of allergy, previous history of otitis, the presence of open mouth, snoring and tonsillar grades (**Table 3**).

Table 3. Risk factors of otitis media with effusions

		Yes, n (%)	No, n (%)
Is anyone smoking in the house? (n:758)		330 (43.5)	428 (56.5)
Is mother smoking? (n:758)		166 (21.9)	592 (78.1)
Is father smoking? (n:758)		419 (55.3)	339 (44.7)
Hearing loss in family? (n:746)		72 (9.7)	674 (90.3)
Who has hearing loss? (n:73)	Father	25 (34.2)	
	Mother	29 (39.7)	
	Sibling	19 (26.1)	
Otitis media in family? (n:717)		100 (13.9)	617 (86.1)
Who has otitis media? (n:100)	Father	19 (19.0)	
	Mother	34 (34.0)	
	Sibling	47 (47.0)	
Breastfeeding (n:745)		703 (94.4)	42 (5.6)
Pacifier usage (n:731)		274 (37.5)	457 (62.5)
Bottle feeding? (n:741)		484 (65.3)	257 (34.7)
Has your child ever had otitis media? (n:730)		100 (13.7)	630 (86.3)
Does your child have hearing loss? (n:725)		23 (3.2)	702 (96.8)
Recurrent upper airway infection (n:720)		270 (37.5)	450 (62.5)
Open mouth sleeping (n: 736)	Always	105 (14.3)	330 (44.8)
	Only when sick	301 (40.9)	
Snoring (n:736)	Always	66 (9.0)	459 (62.4)
	Only when sick	211 (28.7)	
Sleep apnea (n:734)	Always	12 (1.6)	620 (84.5)
	Only when sick	102 (13.9)	

DISCUSSION

This study is an epidemiologic investigation of the prevalence of OME in school-age children, another ear disease, and tonsillar hypertrophy. OME is one of the most common health problems seen in children and it may lead to sequelae or complications such as hearing loss, delay of speech and language. These probable complications may be prevented by early diagnosis of OME. The etiology of OME is multifactorial and various factors effected this process (6-8).

In this study, OME prevalence in primary school children was 2.6% and this rate was low as according to previous literature from Turkey and other countries. The reported prevalence of OME in Turkey is variable depending on the cities. The reported prevalence was 11.2% to 13.3% in Ankara (10-12), 7% to 8.7% in Istanbul (13,14), 16.9% in Denizli (15), 6.5% in Kahramanmaras (8), 11.44% in Trabzon (16), 14,5% in Diyarbakir (4). Our prevalence rates were lower than those reported results and various climatic and environmental factors may explain this low rate. Also, we made diagnosis of OME only by otoscopic examination, if portable tympanometry was used as auxiliary method the rate might have been different. The fact that now parents are conscious and that children are diagnosed earlier can also explain these low rates. Also, some public health initiatives, such as prevention through vaccination, may be responsible for reducing the OME rates. In our study, the incidence of OME was lower than in previous studies, suggesting that vaccination programs may be successful. Also, the low prevalence of OME in our study support the recommendations of guideline that clinicians should not routinely screen children for OME who are not at risk for OME (17).

In the literature, the prevalence of OME is variable on the world, ranging from 1.3 to 31.3%, depending on the countries. In a study from China, the OME prevalence was found 1.3%, while in a study from Kuwait, it was found 31.3% (18,19). The prevalence rates reported in other studies were as follows: 6.5% in the Greece (20), 9.5% in the Netherlands (21), 10% in Easter Island (22), 13.8% in Saudi Arabia (23), and 2.2% in Hong Kong (24). Our prevalence rate was 2.6% in the similar age group. These different results may be related to climatic and environmental factors. Also, some genetic predisposition may be involved. For example, some studies suggest that the Eustachian tube functions may better in the African races and therefore, low rates of OME seen in this region (25,26).

Some authors found that OME was encountered more frequently in boys or girls, whereas others found no differences (18-22). In this study, there is no gender difference in the prevalence of OME. This result is due to the low rate of OME prevalence in our study.

In our study found no relationship between OME and duration of breastfeeding. The most likely explanation for this is that in our study, there were children who have been breastfed for at least one year and breastfeeding is protective against middle ear infections. Breastfeeding of children for at least three months from birth reduces the risk of developing middle ear infections (27). Also, there was no difference in middle ear infections between the breastfed and non-breastfed children. This finding can be explained by our study includes a few children never breastfed, because breast-feeding is very common in Turkey.

Feeding bottle or pacifier usage may play an etiologic role in the development of OME (28,29). In our study found no relationship between OME and feeding bottle or pacifier usage. However, while our results showed a predisposition of increased OME with bottle use, it was not statistically significant. This could be explained by the low prevalence of OME in our study.

Recurrent upper respiratory infections and passive smoking increase the risk of middle ear infection by promoting colonization with pathogens (2,3). The effect of smoke on mucociliary function and consequent risk for OME has been known, but in our study, there is no statistically significant difference between the children had smoking and non-smoking parents.

Some studies show that low incoming level and poor sociodemographic features are risk factors for developing OME related to overcrowding in house, malnutrition, and poor hygiene of home (7,8). Although epidemiologic studies suggest that genetic susceptibility to middle ear diseases such as OME and COME, environmental factors and population characteristics should be taken into consideration. In our study, the prevalence of OME is higher at low incoming level, but this difference statistically insignificant.

Adenotonsillar pathology may be a risk factor for developing OME (30). In this study, we did not evaluate the adenoid size due to this examination needs the endoscope; therefore, we evaluated the only tonsillar sizes. In our study, there was no significant difference between the presence of OME and the presence of open mouth, snoring and tonsil grades. In this study, there is no significant difference between the OME and tonsillar sizes. This issue due to low OME prevalence of our study population.

There are some limitations in our study. First, OME can be diagnosed by otoscopy in the clinic, but if there is any diagnostic doubt, auxiliary diagnostic methods such as pneumatic otoscopy, otomicroscopy, tympanometry and audiometry can be used. In our study, auxiliary diagnostic methods could not be used because otoscopic examinations were performed in schools. Second, children can be more affected auditory and cognitively in chronic OME, while acute OME may appear physiologically after URI and regress spontaneously and its negative effect on the child may be minimal. The distinction between acute and chronic OME can be made with clinical follow-up. We recorded instant condition of the middle ear during the examination, but not differentiate between acute and chronic OME.

CONCLUSION

Though the low prevalence of OME in our study, considering that OME and its possible preventive severe complications screening for OME should be a part of preventive health services particularly for primary school children. The low prevalence of OME in our study support the recommendations of guideline that clinicians should not routinely screen children for OME who are not at risk for OME. However, identifying children with symptoms that can be associated with OME, such as hearing difficulties, vestibular problems, poor academic performance, behavioral problems, or ear discomfort, is still important issue.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Ethics Committee of Mersin University (Permission granted: 07.11.2018, Decision no: 2018/450)

Informed Consent: Informed consent was obtained from the parents of the children evaluated in this study.

Referee Evaluation Process: Externally peer-reviewed.

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