



Araştırma/Research

Sociodemographic, Socioeconomic and Clinical Risk Factors for Chronic Otitis Media in Children

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Abstract

Aim: The aim of present study is to identify COM-related clinic, sociodemographic and socioeconomic risk factors.

Material and Method: 103 children diagnosed for COM and treated in Department of Otorhinolaryngology, Faculty of Medicine, Gaziantep University during 2005-2015 and 116 healthy children were included in this study. The questionnaire about risk factors of COM were filled by interviewing verbatim with mothers and/or fathers of all children.

Result: Patient and control groups were composed of 53 boys (51.5%) and 50 girls (48.5%), and 48 boys (41.4%) and 68 girls (58.6%), respectively. The mean age of patients was 13.1 years (range, 2-16), and the mean age of the control group was 12.05 years (range, 6-16). Multiple logistic regression models and univariate analysis were used to determine association between risk factors and COM. Maternal smoking during pregnancy (p=0.014), otitis media history in the first year of life (p=0.001), recurrent otitis media history (p=0.001), upper respiratory tract infection history in the first year of life (p=0.001), ventilation tube insertion history (p=0.001), tonsillectomy and/or adenoidectomy history (p=0.001), otitis media history in family members (p=0.008) and lack of health insurance (p=0.001) were found to be significantly associated with COM. In multivariate analysis, otitis media history in the first year of life (OR=8,00, %95 CI= [3,34-19,17], p=0.001), father's otitis media history (OR=8.43, %95 CI= [1,47-48,42], p=0.017) and lack of health insurance (OR=3,09 %95 CI=[1,35-7,11], p=0.008) were significantly associated with COM.

Conclusion: Chronic otitis media (COM) is a long-term inflammation of middle ear that leads to irreversible changes in eardrum. COM is a common disease in children, and if not treated, it may cause severe complications and sequelae. Thus, if risk factors causing COM are elucidated, the potential complications might be prevented and prophylactic strategies can be developed. This study indicated that history of otitis media in the first year of life, having a father with history of otitis media and lack of health insurance are risk factors for COM.

Keywords: Chronic otitis media, smoking, Otitis media, Upper respiratory tract infection, Health insurance, strategy

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Çocuklarda Kronik Otitis Media için Sosyodemografik, Sosyoekonomik ve Klinik Risk Faktörleri

Öz

Amaç: Bu çalışmanın amacı çocuklarda KOM ile ilişkili klinik, sosyodemografik ve sosyoekonomik risk faktörlerini belirlemektir.

Metot: Bu çalışmaya 2005-2015 yılları arasında Gaziantep Üniversitesi Tıp Fakültesi KBB Anabilim Dalı'nda KOM tanısı ve tedavisi almış 103 çocuk hasta ve 116 sağlıklı çocuk dahil edildi. Risk faktörlerini içeren anketler hasta ve kontrol grubundaki çocukların anne ve/veya babası ile birebir görüşülerek dolduruldu.

Bulgular: Hastaların 53'ü erkek (%51,5) ve 50'si kızdı (%48,5). Kontrol grubunda 48 erkek (%41,4) ve 68 kız (%58,6) çocuk bulunmaktaydı. Hastaların yaş ortalaması 13,1 (yaş aralığı, 2-16) ve kontrol grubunun yaş ortalaması 12,05 (yaş aralığı, 6-16) idi. Belirlenen risk faktörleri ile KOM arasındaki ilişkiyi belirlemek için çok değişkenli regresyon modeli ve tek değişkenli analiz kullanıldı. Annenin gebelikte sigara kullanması (p=0,014), ilk yaşta otitis media geçirme (p=0,001), sık otitis media geçirme (p=0,001), ilk yaşta sık üst solunum yolu enfeksiyonu geçirme (p=0,001), önceki kulak zarına ventilasyon tüpü tatbiki (p=0,001), önceki tonsillektomi ve/veya adenoidektomi (p=0,001), babada (p=0,008) ve kardeşte otitis media hikayesi (p=0,008) ve aile reisinin sigortasının olmaması (p=0,001) KOM ile anlamlı olarak ilişkili bulundu. Çok-değişkenli analizde ilk yaşta otitis media geçirme (OR=8,00, %95 GA=[3,34-19,17], p=0,000), babada otitis media hikayesi (OR=8,438, %95 GA=[1,47-48,42], p=0,017) ve aile reisinin sağlık güvencesinin olmaması (OR=3,091 %95 GA=[1,35-7,110], p=0,008) KOM ile ilişkili risk faktörleri olarak bulundu.

Sonuç: Kronik otitis media (KOM) orta kulağın kulak zarında kalıcı değişikliklere yol açan uzun süreli enflamasyondur. KOM çocuklarda sık görülen bir hastalıktır ve tam olarak tedavi edilmezse ciddi komplikasyonlara ve sekillere yol açabilir. Bu hastalıkla ilişkili risk faktörleri ortaya konulursa potansiyel komplikasyonlar önlenebilir ve önleyici stratejiler geliştirilir. Bu çalışmada elde edilen sonuçlara göre ilk yaşta otitis media geçirme, babada otitis media hikayesi aile reisinin sağlık güvencesinin olmaması KOM için risk faktörleridir.

Anahtar Kelimeler: Aktif kronik otitis media, sigara kullanımı, orta kulak iltihabı, üst solunum yolu enfeksiyonu, sağlık güvencesi, strateji.

INTRODUCTION

Chronic otitis media (COM) is a disease characterized by chronic inflammation and infections of mastoid cavities and middle ear mucosa. The incidence of this disease ranges from 14 to 62%, and the prevalence ranges from 2 to 52%(1).

The etiopathogenesis of COM has not yet been fully elucidated although the eustachian tubular dysfunction has been generally suggested as the underlying mechanism. Other factors that may contribute to COM development include gender, congenital central facial deformities, Down syndrome, nutritional type, environmental factors, recurrent otitis media, low socioeconomic status, smoking exposure, allergy, nasopharyngeal diseases (adenoid hypertrophy), upper respiratory tract infections (rhinosinusitis), immune system diseases and gastroesophageal reflux. Frequently isolated microorganisms in the patient with COM are P. aeruginosa, S. aureus, Diptheroids, Streptococci, and Haemophilus Influenza, and to a lesser extent other enteric gram negative and anaerobic bacteria (2).

There is no reliable data on COM frequency even in developed countries. Fliss et al. (3) have found COM frequency 39 / 100,000 in children under the age of 15 in Israel. Other research team Kaya et al. (4) have found higher COM prevalence in children who live in rural areas. COM has been commonly recorded in Eskimo, North American and Australian, however, it is less common in white Caucasian.

Early diagnosis and treatment of acute and serous otitis media also reduce the incidence of COM (3). The etiology of KOM is still unclear. Eustachian tube dysfunction is accused in COM as well as in all types of otitis media, however, enough data in this subject is not available. It is stated that poor environmental conditions, nutrition, upper respiratory tract infections (URTI), smoking, intensive populated indoor environment increase the incidence of COM even is not frequently.

When examining the microbiology of COM, the frequency of existence of some microorganisms were detected in following frequency; *P. aeruginosa* 27%, *S. aureus* 24%, *S. epidermidis* 9%, proteus strains 7%, beta hemolytic streptococci 7%, *H. influenza* 6%, Enterococci 4% (Shown in Table 1). These agents are often found mixed in patient (5). The risk factors suggested in the COM are Race and genetic factors; Craniofacial anomalies; Bad socioeconomic status; Bad and inadequate health services; Recurrent otitis media; Frequent upper respiratory tract infection; Immune system disorders; and Lymphoid hyperplasia (4).

COM is typically a persistent disease. The infection may show active, intermittent and inactive periods. The most common complaints are hearing loss and ear drainage. As COM can be silent in cases, can be also aggressive in children, and if it is not treated, can lead to irreversible sequelae and serious complications. For these reasons, early diagnosis and treatment of COM in children is important. Knowledge of clinical, sociodemographic and socioeconomic risk factors for COM in children may benefit for early diagnosis of this disease and development of preventive strategies.

To our knowledge scientific data on risk factors for COM in children are limited in the literature. Therefore, we aimed to determine the clinical, sociodemographic and socioeconomic risk factors of COM in children.

MATERIAL AND METHODS

COM diagnostic criteria were designated as ear lobe perforation with or without ear drainage and middle ear inflammation lasting more than 3 months. This study was carried out at Gaziantep University, Faculty of Medicine, Ear Nose and Throat Department. Patients with COM between 2005 and 2016 and their parents were invited to the hospital. The questionnaire containing questions about the risk factors that we thought might be related to COM was filled in by one-on-one interviews with parents and children. The control group was selected from primary school children without any chronic or recurrent ear disease and was asked to fill in the same questionnaire from the parents of the children. The

parameters included in the questionnaire; Sex, ear flow, allergic symptoms, prenatal pregnancy, pregnancy and postnatal cigarette usage, child cigarette exposure, bottle feeding, pacifier usage, start time of supplementary food, otitis media story before 1 year old, URTI frequency, otitis media frequency, ventilation tube story, snoring, tonsillectomy and / or adenoidectomy story, family history of otitis media, number of siblings, number of family members, parental education level, family income level, maternal health status, maternal working status, birth weight of child, birth week and duration of breastfeeding were questioned.

Patients who had KOM with cholesteatoma and who had a diagnosis of adhesive otitis media were not included in the study. Other exclusion criteria were craniofacial anomaly, primer ciliary dyskinesia, and immunodeficiency. Gaziantep University Medical Faculty Ethics Committee approved the study.

Statistical Analysis

The normal distribution suitability of the variables was tested with the Shapiro wilk test. Student t test was used to compare two independent groups for normal dividing variables, and chi-square tests were used to compare categorical variables in two groups. The association of COM with risk factors was determined using single-variable logistic regression analysis. Independent factors, which were in univariate relation with COM ($p < 0.05$), were included in the multivariate logistic regression analysis. All analyzes were performed using SPSS Windows Version 22.0. $P < 0.05$ was considered significant.

RESULTS

103 patients and 116 children without ear diseases were included in the study. There were 50 females (48.5%) and 53 males (51.5%) in the patient group, and 68 girls (58.6%) and 48 males (41.4%) in the control group. There was no statistically significant difference between both groups in terms of gender distribution ($p = 0,135$).

The mean age of the patients was 13.1 (range, 6-16), and the mean age of the control group was 12.05 (range, 2-16). There was a significant difference between the ages of patient and control groups ($p = 0,003$). There was a statistically significant relationship between smoking in the mother's pregnancy and COM ($p = 0.014$). There was a statistically significant correlation between smoking exposure and COM ($p = 0.014$). There was a statistically significant relationship between otitis media attacks at early ages and COM ($p = 0.001$). Sociodemographic parameters of patient and control groups were summarized in Table 2.

Table 1. Microorganisms causing otitis media.

Bacteria	Case number (n=118)
<i>Pseudomonas aeruginosa</i>	56
<i>S.aureus</i>	18
<i>Difteroidler</i>	8
<i>S.pneumonia</i>	7
<i>H.influenza</i>	6
<i>Bacteroides</i>	3
<i>Candida albicans</i>	2
<i>Candida parapsilosis</i>	2
<i>Enterococcus</i>	2
<i>Actinobacter</i>	2
<i>S.epidermidis</i>	1
<i>Morganelamorgagnii</i>	1
<i>Providenciastuartilii</i>	1
<i>Klebsiella strains</i>	1
<i>Proteustrains</i>	1
<i>Serratiamarcescenses</i>	1
<i>Moraxella</i>	1
<i>P.cepacia</i>	1
<i>Providenciaerttgeri</i>	1
<i>P.maltophilia</i>	1

Table 2. Sociodemographic parameters of patient and control groups

Variables	patients (n=103)	Control (n=116)	P
<i>Age (Mean/year)</i>	13,1±3,04	12,05±2,43	0,003
<i>Sex(Number/%)</i>			
<i>Female</i>	50/48,5	68/58,6	0,135
<i>Male</i>	53/51,5	48/41,4	
<i>Number of siblings</i>	3,8±3,83	3,6±2,22	0,459
<i>Number of family member</i>	6,2	6,0	0,223
<i>Maternal education level (Number/%)</i>			
<i>Illiterate</i>	22/21,4	15/12,9	0,071
<i>Literate</i>	11/10,7	11/9,5	
<i>Primary education</i>	68/66,0	80/69,0	
<i>High school</i>	2/1,9	7/6	0,071
<i>University</i>	0/0	3/2,6	
<i>Father's level of education</i>			
<i>Illiterate</i>	6/5,8	4/3,4	0,414
<i>Literate</i>	7/6,8	14/12,1	
<i>Primary education</i>	74/71,8	74/63,8	
<i>High school</i>	12/11,7	16/13,8	0,414
<i>University</i>	4/3,9	8/6,9	
<i>Nursery (Number/%)</i>			
<i>Yes</i>	10/9,7	15/12,9	0,454
<i>No</i>	93/90,3	101/87,1	

17 (16.5%) of the infected children and 9 (7.8%) of the control group had more than 7 URTI attacks in the first year. 55 (53.4%) of patient and 92 (79.3%) of the controls had URTI attack up to three in their first year. According to the analysis of the data, there exist a statistically significant relationship between COM and URTI at first age ($p=0,001$). A statistically significant relationship was found between the history of tonsillectomy and adenoidectomy and COM ($p=0,001$). There was a statistically significant relationship between ventilation tube history and COM ($p=0,001$). There was a statistically significant relationship between income level of family and COM ($p=0,399$).

75 (72.8%) of the patient group and 103 (89.6%) of the control group have social health insurance. There was a statistically significant relationship between the presence of family health insurance and COM ($p=0,001$).

Table 3 . Clinical parameters of the patient and control group.

Variables (Number/%)	Patients	Control	P values
Smoking before pregnancy			
Yes	8/7,8	3/2,6	0,080
No	95/92,2	113/97,4	
Smoking during pregnancy			
Yes	8/7,8	1/0,9	
No	95/92,2	115/99,1	0,014
Smoking in post- pregnancy			
Yes	10/9,7	4/3,4	0,059
No	93/90,3	112/96,6	
Smoking exposure of child			
Yes	49/47,6	47/40,5	
No	54/52,4	69/59,5	0,294
Birth week of child			
Lesser than 37 weeks	19/18,4	33/28,4	
Over than 37 weeks	84/81,6	83/71,6	0,083
Child's birth weight			
Lesser than 2.5 kg	16/15,5	24/20,7	
Over than 2.5 kg	87/84,5	92/79,3	0,324
The child's breastfeeding period (months)			
	13,4±10,06	13,3±8,74	0,946
The time for the child to start additional food			
Lesser than 6 months	15/14,6	30/25,9	
Over than 6 months	88/85,4	86/74,1	0,039
Nipple usage story			
Yes	58/56,3	81/69,8	
No	45/43,7	35/30,2	0,038
Feeding time with bottle			
No	29/28,2	38/32,8	
6 months and lesser	19/18,4	21/18,1	0,750
Over than 6 months	55/53,4	57/49,1	
Otitis media story at the first age			
	40/38,8	9/7,8	

<i>Yes</i>	<i>63/61,2</i>	<i>107/92,2</i>	<i>0,001</i>
<i>No</i>			
Upper respiratory infection at first age			
<i>3 and lesser</i>	<i>55/53,4</i>	<i>92/79,3</i>	
<i>Between 3 and 7</i>	<i>31/30,1</i>	<i>15/12,9</i>	
<i>7 and over</i>	<i>17/16,5</i>	<i>9/7,8</i>	<i>0,001</i>
Otitis frequency in a year			
<i>3 and lesser</i>	<i>56/54,4</i>	<i>94/93,1</i>	
<i>Over than 3</i>	<i>47/45,6</i>	<i>7/6,9</i>	<i>0,001</i>
Number of antibiotics used per year	<i>3,7±3,8</i>	<i>2,9±2,2</i>	<i>0.084</i>
Allergy story in child			
<i>Yes</i>	<i>36/35,0</i>	<i>40/34,8</i>	
<i>No</i>	<i>67/65,0</i>	<i>75/65,2</i>	<i>0,979</i>
Snoring			
<i>Nightly</i>	<i>18/17,5</i>	<i>11/9,5</i>	
<i>Occasionally</i>	<i>35/34,0</i>	<i>38/32,8</i>	<i>0,154</i>
<i>During URTI</i>	<i>1/1,0</i>	<i>0/0</i>	
<i>No</i>	<i>49/47,6</i>	<i>67/57,8</i>	
Tonsillectomy and/ or adenoidectomy			
<i>Yes</i>	<i>29/28,2</i>	<i>8/6,9</i>	
<i>No</i>	<i>74/71,8</i>	<i>108/93,1</i>	<i>0.001</i>
Ear canal ventilation tube			
<i>Yes</i>	<i>25/24,3</i>	<i>3/2,6</i>	
<i>No</i>	<i>78/75,7</i>	<i>112/97,4</i>	<i>0,001</i>
Family otitis story			
<i>No</i>	<i>67/65,0</i>	<i>94/81</i>	
<i>Mather</i>	<i>4/3,9</i>	<i>6/5,2</i>	
<i>Father</i>	<i>10/9,7</i>	<i>2/1,7</i>	<i>0,008</i>
<i>Sibling</i>	<i>22/21,4</i>	<i>14/12,1</i>	

Twenty patients (19.4%) had continuous and 47 patients (45.6%) had occasionally ear infections, and 4 patients (3.9%) had ear discharges during URTI. 32 of the patients (31.1%) had no history of ear drainage. Clinical parameters of the patient and control group are summarized in Table 3. Lastly, we recorded socioeconomic risk factor on COM are summarized in Table 4.

In multivariate analysis, otitis media in first age (OR = 8.0095% GA = [3,34-19,17] p = 0.001) and otitis media in father (OR = 8.43 95 % GA=[1.47-48.42] P = 0.017) and absence of family' healthinsurance (OR = 3.09, 95% GA = [1,35-7,110] p = 0.008) were found as risk factors associated with COM. Results of multivariate logistic regression models adjusted for age and sex are summarized in Table 5.

Table 4. Socioeconomic risk factors of the patient and control group.

<i>Variables (Number/%)</i>	<i>Patient(n=103)</i>	<i>Control (n=116)</i>	<i>P values</i>
<i>Family income level</i>			<i>0,399</i>
<i>Lesser than 1.500 Turkish Liras (TL)</i>	<i>80 /77,7</i>	<i>81/69,8</i>	
<i>1.500-3000 TL</i>	<i>18/17,5</i>	<i>26/22,4</i>	
<i>Over than 3000 TL</i>	<i>5/4,9</i>	<i>9/7,8</i>	
<i>Type of heating</i>			<i>0,354</i>
<i>Stove</i>	<i>88/85,4</i>	<i>95/81,9</i>	
<i>Central coal</i>	<i>4/3,9</i>	<i>10/8,6</i>	
<i>Natural gas</i>	<i>11/10,7</i>	<i>11/9,5</i>	
<i>Mather's working status</i>			<i>0,601</i>
<i>Yes</i>	<i>5/4,9</i>	<i>4/3,4</i>	
<i>No</i>	<i>98/95,1</i>	<i>112/96,6</i>	
<i>Family insurance</i>			<i>0,001</i>
<i>Yes</i>	<i>75/72,8</i>	<i>103/89,6</i>	
<i>No</i>	<i>28/27,2</i>	<i>12/10,4</i>	
<i>The house where they live</i>			<i>0,001</i>
<i>Own</i>	<i>49/47,6</i>	<i>106/91,4</i>	
<i>Rent</i>	<i>41/39,8</i>	<i>1/0,9</i>	
<i>Belong to near</i>	<i>13/12,</i>	<i>9/7,8</i>	

Table 5. Results of multivariate logistic regression models adjusted for age and sex.

<i>Variables</i>	<i>OR</i>	<i>% 95 GA</i>	<i>P</i>
<i>Age</i>	<i>1,24</i>	<i>1,09-1,41</i>	<i>0,001</i>
<i>Sex</i>	<i>1,25</i>	<i>0,66-2,36</i>	<i>0,479</i>
<i>Smoking during pregnancy</i>	<i>6,04</i>	<i>0,64-56,65</i>	<i>0,115</i>
<i>Otitis media in first age</i>	<i>8,00</i>	<i>3,33-19,16</i>	<i>0,001</i>
<i>Otitis media story in Mather</i>	<i>0,47</i>	<i>0,10-2,22</i>	<i>0,347</i>
<i>Otitis media story in Father</i>	<i>8,43</i>	<i>1,47-48,42</i>	<i>0,017</i>
<i>Otitis media story in Siblings</i>	<i>1,72</i>	<i>0,73-4,07</i>	<i>0,213</i>
<i>The family does not have health insurance</i>	<i>3,09</i>	<i>1,34-7,11</i>	<i>0,008</i>

DISCUSSION

Various studies indicated that acute otitis media risk can be augmented by some factors such as age, sex, sibling number, number of people living a home, low birth weight, premature birth weight, not drinking enough mother's milk, use of pacifier, bottle feeding, kinder garden story, allergy, seasonal period, low socioeconomic condition, educational level of parents. Several studies are available in the literature about this topic, and different results were indicated as follows in some of these studies; Eliçora et al. (6) studied risk factor causing otitis media with effusion in 170 children with adenoid hypertrophy in between 2005-2008. 118 of these patients were male and 52 were female. The patients divided into two groups as only adenoid hypertrophy and adenoid hypertrophy and otitis media with effusion as well, and these two groups were compared in terms of age, sex, feeding with mother's milk, bottle feeding, exposure to tobacco smoke, familial predisposition, allergy, congenital diseases and

continue education. Significant difference in factors of breastfeeding, bottle feeding, familial predisposition, exposure to tobacco smoke and allergy were not recorded. However, the relations of the factors male gender, congenital diseases and continuation to school with otitis media with effusions were found significant.

Bardyet al. (7) studied epidemiology and risk factors of otitis media and the frequency of subspecies in Australian native children, which reported that AOM's frequency was 7,1-12,8%, KOM was 10,5 – 30,3 % and eardrum perforation was 31-50 %. Otitis media frequency in native children was found higher than non-natives. Low socioeconomic condition, family structure, crowded family and exposure to cigarette smoke are listed as factors that the reason of these results in native children. But, no relation between using a swimming pool and the frequency of otitis media was found.

Skoneret al. (8) indicated that allergic rhinitis is a risk factor for otitis media in their study named allergic rhinitis, histamine, and otitis media.

Amusaet al. (9) studied the epidemiology of otitis media in a local tropical African society (Nigeria). 600 patients, 299 men and 301 women, participated in the study. The patients are in age range of 0-12. Prevalence of Otitis Media was found as 14,7 %, consist of 11,8 % acute otitis media, 2,5 % COM and less than 1 % EOM. In the present study, no significant relation were between found otitis media and duration of breastfeeding. The most significant relation was recorded between wood smoke exposure and otitis media. Low educational level of mother and numerous children sleeping in same room have strong relations with otitis media were detected.

Bruneauet al. (10) studied prevalence of the middle ear infections and associated risk factors in children between the age of 2 and 6. 122 children attended to this study, and the evaluations made in the study are environmental factors and life style, audiological, medical file analysis, serum sampling and parental survey. The prevalence of middle ear infection in this age group in the present study was found to be 9,4 %- 10,8%. The vital factors that are found as associated with middle ear infection are number of people sleeping in the same room, the number of sibling who has ear discharge, how many time otitis media occurs at first age and bottle feeding.

Moriniereet al. (11) determined the risk factors for this disease in the study they have done, which are having otitis media earlier than first six months, male gender, not feed on breast milk, low socioeconomic condition and familial factors. The exposure to cigarette smoke and having allergy history are evaluated as arguable.

Mills (12) examined 191 children with otitis media with effusion for two years and found that ear discharge is a serious risk factor for COM. Daly et al. (13) studied the effect of prenatal, congenital and environmental risk factors. 596 infant in health facility included in the study and progressively investigated. The mother's diet in prenatal period and her diseases and infant's age, cigarette smoke exposure and care were investigated. 39 percent of the children had one time acute otitis media attack,

and 20 percent had recurrent otitis media attack in their first six months. In that study, respiratory system infections, the number of siblings, otitis media story in father, mother and siblings are reported to be found as related factors with otitis media. Mother's use of vitamin C at high level in the prenatal period found in reverse relation with otitis media. Consequently, the relation of prenatal factors with otitis media is not fully explained, and has been concluded that environmental and congenital factors having a close relationship with otitis media.

Fireman (14) , in his study evaluated the relations of otitis media and eustachian tube dysfunction with allergic rhinitis that 25-40% of upper respiratory infections in the cases under three resulted in otitis media. 40-50% of children over three years of age with COM have allergic rhinitis. In the study, allergic rhinitis has been shown to trigger otitis media in children and lead to exacerbation of the otitis media by performing eustachian tube dysfunction.

Alhoet al (15) included 2012 children in the study investigating the risk factor of chronic EOM infants. Having already otitis media is found to be the highest risk factor for otitis media. The other important risk factors are found to be nursery, male gender, and Autumn.

Rasmussen (16) evaluated the effects of familial factors, nursery and passive smoking on the incidence of long-term secretory otitis media (SOM) in a study. In the study 1306 Swedish children were followed regularly from birth until the age of 7. Consequently, children whose one of siblings has SOM have 4 times more risk than the other children. There was no relationship between the smoking habits of parents and the incidence of long-term SOM. Children in the care center have 2.6 times more risk for long-term SOM than those who do not.

Kraemer et al. (17)

reported that chronic nasal obstruction, atrophy, and exposure to cigarette smoke are important factor and the combinations of these factors further increased the risk in the study of etiological factors in chronic middle ear effusions. They concluded that use of prophylactic antibiotics, pneumococcal vaccine, antihistaminic treatment, nasal decongestant, immunotherapy, and avoidance of domestic irritants are effective methods reduce chronic otitis media.

There are a few literature studies show what the risk factors for AOM are not risk factors for COM. Kim et al. (18) included 9321 people from 60 different regions to the study investigates the risk factors and COM prevalence. The prevalence of AOM is found to be %2,85, and COM to be 2,19%. Case-control studies were conducted to identify risk factors for COM, and living area (city-rural) and sex do not affect the prevalence of COM. Age, living in crowded area, economic status, parental age, body weight, smoking, early childhood otitis media in first age, the number of children at home are reported to be risk factors for COM. Other factors such as residence, education, social class, height, duration of breastfeeding, nasal septal deviation, nasal discharge, and allergic symptoms have been reported to have little effect on COM prevalence.

Hammaren-Malmi et al. (19) analyzed the risk factors causing middle ear infections in children. In the study, 159 children with recurrent otitis media and their parents and 55 pediatric patients with COM and their parents were evaluated. The all children are younger than four. There is no any significant difference between these two groups in terms of living in nursing life, the number of siblings and smoking in the family, however, allergy and asthma frequency were found to be lower in the children with COM compared to the with recurrent otitis media.

Mionet al. (20) investigated the role of rhinitis in 51 patients with COM. The patients were divided into three groups as follow; the patients with allergic rhinitis, with non-allergic rhinitis with eosinophilic syndrome, and without rhinitis subtypes. Age, sex, nasal disease number and surgical intervention were considered separately in each group. In the study, 50% of the patients were found to have non-allergic rhinitis leading to rhinitis or eosinophilia. They have recorded a significant relation between rhinitis and COM.

Veen EL et al. (21) included 100 patients with COM and 161 control children to a study investigates the related risk factors with COM. In this study, tympanostomy tube insertion into the tympanic membrane, having UPRTI over 3 times in last 6 months, poorly educated parents, a large number of siblings, living in kindergarten, and having over three attacks of otitis media in one year are reported to be risk factors for COM.

Lasisi et al.(22) included 189 patients with COM and 100 control individuals to the study evaluated hearing loss and socioeconomic status in CSOM, and a hearing loss has been detected in 89 of 189 patients (47%) with COM. 72 % of the patients had otitis media attack in the first year of age.61 of 89 CSOM patients with hearing loss have been detected to have low socioeconomic status. In the study, low socioeconomic status and CSOM have a significant relationship between each other has been reported. CSOM and otitis media attack in the first year of age, UPRTI and age have not a significant relationship.

In a study performed by Koch et al (23), 465 CSOM patients have been included and investigated the risk factors for CSOM. The children have been followed for 2 years, and consequently, smoking at home, ear discharge in mother, and frequent UPRTI have been found to be the risk factor for CSOM.

Jensen et al. (24) included 307 CSOM patients to the study to evaluates the results of long-term follow-up of children have high risk in terms of otitis media. COM prevalence has been found to be 32/236 (14%) between 0-4 years old, 21/236 (9%) between 11-15 years old.In the study, low educational status and otitis media attacks of mother are recorded to be risk-increasing factors.

Shaheen et al. (25) observed socioeconomic factors of 4280 COM patients who went to school regularly in rural areas. The rate of COM was found relatively higher in girls. In the study, the parameters related to COM were reported as sex, maternal education level, income status of the family, number of individuals in the family and health precautions of the children.

In the present study, we observed if the following factors increase COM risk; age, sex, ear discharge, allergic symptoms, smoking history in the periods of pre-pregnancy, pregnancy and post-pregnancy, smoking after childbirth, low birth weight, Premature birth, breastfeeding period, bottle feeding, use of pacifier, start time of additional food, otitis story and number of UPRTI in the first year of age, nursery, previous ventilation tube insertion into the ear, snoring, sleeping open mouth, previous tonsillectomy and adenoidectomy stories, otitis media story in family, the number of siblings and individuals in family, educational status of parents, economic status of family, heating type of home, the existence of the social security of the family, and mother's working status. Univariate and multivariate analyzes with high sensitivity and specificity were performed for this purpose. Factors that increase statistically COM risk in univariate analysis are mothers smoking during pregnancy, children's exposure to cigarette smoke, otitis media and UPRTI in first year of age, the number of otitis media attacks in a year, previous tonsillectomy and/or adenoidectomy story, insertion of ventilation tube, otitis media in the parents and siblings and no social security of the family. Mother's smoking during pregnancy or child's exposure to cigarette smoking after birth cause mucociliary dysfunction and disturbance of Eustachian tube drainage result in COM. The cause for previous tonsillectomy, adenoidectomy and ventilation tube insertion increase the risk for COM may be pre-ventilation problem in middle ear result in development of retraction or middle ear secretion stasis. The cause for high number of otitis media in first year of age increase the risk for COM may be that immune functions are not fully developed at first age. Mother's smoking during periods of pre-and post- pregnancy and child's birth weight, birth week, duration of breastfeeding, early start time of additional food, use of pacifier, bottle feeding, the number of siblings and individuals in home, nursery, the number of antibiotic used per year, snoring, maternal otitis media, educational status of parents, economic status of family, heating type, and mother's work status are found to be not related with development of COM. Independent factors significantly increase the risk for COM such as maternal smoking, child's smoking exposure after birth, prevalence of otitis media and UPRTI, number of otitis media attack per year, previous tonsillectomy and adenoidectomy stories and insertion of ventilation tube, otitis media story in the family, and no social security of the family were included in the multivariate analysis, and some of these independent factors are observed increasing the risk for COM such as otitis media attack in first year of age, paternal otitis media story, and no health insurance in the family in this analysis. However, otitis media story in the siblings, previous tonsillectomy and/or adenoidectomy stories and ventilation tube insertion, the frequency of otitis media attacks per year, maternal smoking during pregnancy, smoking during the breastfeeding period were not among the factors that increase the risk for COM in the multivariate analysis, although they are found to be related with COM in the univariate analysis. According to the multivariate analysis, those who have had otitis media at the first age carry 8 times more disease risk than those who did not. Those whose father has otitis media have 8.4 times more risk

than those whose father has not. Those whose family has not health insurance have 3 times more risk for COM than those whose family has.

Some factors known to be involved in the etiology of AOM have been shown not to increase the risk of COM in our study such as allergic story in the child, low birth weight, premature birth, sex, nursery or living in crowded environments, inadequate breastfeeding, bottle feeding, and use of pacifier (7-9). This may be due to the ease of access to the healthcare facility in our country or the frequent use of antibiotics for some reasons such as UPRTIs and AOMs. In our study, low economic status of family is among the factors not increase the risk for COM. This may be due to even the individuals whose economic status is not good enough have health insurance and can easily benefit from health care. Maternal otitis media does not increase the risk for COM in the child, but parental and brotherly otitis media increase the risk for otitis media, which can be explained by interited factors causing COM passing from father to child. In our study, the low level of family economic status did not increase the risk for COM in children, which is the reason of that accession to health facility is easy.

Many studies investigating risk factors associated with COM have reported that the socioeconomic level of the family increases the risk of COM. In this study, the economic status of family, home heating type, the house where she live is owned by herself or someone else, parental educational level have been shown not to be related with COM. However, family health insurance determining the child's possibility of accessibility to the healthcare found to be an important risk factor for COM.

The children who had otitis media story in first year of age have high risk for COM in later ages have been found in our study, and the probable causes of which may be not fully developed immune functions; and disturbed ciliary activity by otitis media attack. Similarly, the dysfunction of eustachian tube may increase the risk for COM in the future

This study has some limitations. The low number of patients and controls may have reduced the number of samples studied and may have affected study statistics. More significant results can be obtained with studies carried out in larger populations.

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