International Journal of Research in Medical and Basic Sciences
Volume 8 Issue 01, January 2022 ISSN: 2455-2569 Impact Factor: 6.997
Journal Homepage: http://mbsresearch.com, Email: mbsresearchp@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal

RISK FACTORS FOR THE DEVELOPMENT OF CHRONIC PURULENT OTITIS MEDIA IN CHILDREN.

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Abstract

Introduction: Chronic suppurative otitis media (CSOM) is the result of an initial episode of acute otitis media and is characterized by persistent discharge from the middle ear.

Purpose: To establish the role of various risk factors for the development of chronic suppurative otitis media among children who received treatment on the basis of the ENT department of the children's multidisciplinary medical clinical center and the 1-family polyclinic of the Samarkand city.

Methods: Using a case-control study design, 78 sick children with chronic suppurative otitis media and 156 relatively healthy children in the control group were compared to determine various common risk factors for the development of the disease. We examined the following risk factors: gender, age, socioeconomic status (SES), diet, passive smoking, snoring, persistent rhinorrhea, positive throat culture, seasonal and allergic rhinitis. Multiple logistic regression analysis was performed by including variables with p <0.30 knowledge in the bi-variant analysis.

Results: According to the results of the study, case control, socio-demographic factors (gender, age, SES) among patients of the main and control groups were statistically comparable. The main risk factors for chronic suppurative otitis media identified by bi-variant analysis included persistent rhinorrhea, snoring, and seasonal rhinitis. In multiple logistic regression analysis, persistent rhinorrhea (p <0.01, CR(chance ratio) = 4.8, 95% CI(confidence index) 2.74-8.76), snoring (p = 0.01, CR = 3.41, 95% CI 1.91-6 , 01), seasonal rhinitis (p = 0.001, CR = 5.8, 95% CI = 3.1-10.5) and passive smoking (p <0.19, CR = 1.4, 95% CI 0.82 - 2.48) were recognized as important risk factors for chronic suppurative otitis media. Age, gender, SES, parental education, seasonal or allergic rhinitis, inadequate nutrition, and exposure to household smoke were not significant risk factors.

Conclusions: Snoring, persistent rhinorrhea, seasonal rhinitis and passive smoking are risk factors for the development of chronic suppurative otitis media. Eliminating these risk factors can significantly reduce the risk of developing chronic suppurative otitis media among the child population.

Key words: Chronic suppurative otitis media, risk factors, case control.

Introduction

Chronic suppurative otitis media (CSOM) is the result of an initial episode of acute otitis media and is characterized by persistent discharge from the middle ear through a perforation of the tympanic membrane [1.2]. This is an important cause of hearing loss, especially in developing countries, particularly in Uzbekistan.

Different definitions of CSOM and the inclusion of patients with cholesteatoma in the data on the prevalence of CSOM do not allow an accurate assessment of the true prevalence and incidence of CSOM. CSOM occurs most frequently in the first 5 years of life [20], and is most common in developing countries, in special populations such as children with craniofacial abnormalities [3], and in some racial groups [19]. The highest prevalence of CSOM in children is noted among residents of Alaska, Canada, Greenland, America and ranges from 7% to 46% [4-5]. Intermediate prevalence rates are found in countries in Southeast Asia in the Middle East and range from 1% to 6% [5,11,14]. The lowest prevalence is found in highly industrialized countries such as the United Kingdom and the United States: <1% [4,5].

Some scientists [8] have determined that the parents have a history of chronic otitis media, as well as crowding conditions, as significant risk factors for the development of CSOM. Also, it was not possible to establish a link between CSOM and allergy, recurrent upper respiratory tract infections, gender, age of parents or passive smoking. However, from a clinical point of view, some of these risk factors are likely to play a role in CSOM [6,9]. To date, no quantitative data have been published on the risk factors for CSOM, such as chance ratios or predictive models, that can predict which children develop CSOM and which do not.

The high prevalence of this disease in children in some countries and its effect on hearing indicates the need for well-designed epidemiological studies of risk factors and interventions to reduce the prevalence. Until now, we have not come across a single systematic study of risk factors for chronic suppurative otitis media in children of Central Asia. A number of internal and external risk factors have been reported to predispose a child to otitis media. Younger age, male gender, the presence of chronic suppurative otitis media in relatives, early onset of otitis media, low SES, inadequate nutrition, recurrent upper respiratory tract infections, snoring, allergic rhinitis and passive smoking are indicated as possible risk factors [4,7, 8,10]. The variability of risk

factors in different countries is often a reflection of sociocultural differences in the studied population [12].

The aim of this study was to search for common risk factors for chronic suppurative otitis media among children living in Samarkand. We have selected preschool children in the main group, which is known to be the most susceptible to this disease in the world.

Materials and methods

This study was carried out on the basis of the ENT department of the children's multidisciplinary medical clinical center of the 1-family polyclinic of the Samarkand city from July 2019 to April 2021. All data were collected retrospectively from the database of patients of the RMDCMC of the Samarkand region. The main group consisted of 78 sick children with CSOM. For each case, 2 controls were matched with a total of 156 relatively healthy children. Exclusion criteria included: children with Down syndrome, cleft palate, systemic diseases such as juvenile diabetes, nephrotic syndrome, and children with immunodeficiency conditions, as such patients are more at greater risk of developing chronic suppurative otitis media.

The sample size was calculated to determine whether persistent rhinorrhea is a risk factor for the development of chronic suppurative otitis media. We expected that the likelihood of a history of persistent rhinorrhea in someone who was diagnosed with CSOM would be three times higher than in the control group. An estimated sample size of 75 cases and 150 controls will have 90% power to detect the difference between two proportions using a two-group x2-squared continuity-corrected test or Fisher's exact test with a two-tailed significance level of 0.05. The calculations of the sample size were carried out using the R-studio 3.6.2 program and the program for calculating the sample size. **Ethics committee approval**

The study design and protocols were approved by the ethics committee of SamStateMI.

Clinical and audiological examinations

All 234 children were examined for weight, height, mean shoulder circumference and the presence of congenital anomalies. All children were examined by an ENT doctor. After the removal of wax in the ear canal, children underwent a second examination. Otoscopy was performed to identify patients with chronic suppurative otitis media (CSOM). Other forms of the disease were excluded from the study. Subsequently,

tympanometry was performed using a portable tympanometer(Portable tympanometerOtometrics OTOFLEX 100, China). The following types of curves were obtained: Curve A (norm); curve B (otitis media with effusion); curve C (otitis media with eustachian tube block). Children over 3 years old underwent screening audiometry with a stimulus intensity of 40 dB. And children under the age of 3 were given free field testing using calibrated sound level meters.

Diagnostic criteria

A child with a history of ear discharge following a central perforation of the tympanic membrane for> 2 weeks was diagnosed with CSOM. A throat swab was taken from all children assigned to cases and controls. The sample was then sent to the microbiology department.

Research questionnaire

A three-part questionnaire was developed. The first part contained socio-demographic information about all participants. The second part contained detailed information on the clinical examination of each child, audiometric thresholds for pure tone and tympanometry results and was filled out for all children. The last, third part contained information on risk factors for both patients and the control group and included the following risk factors: age, gender, SES, nutrition, passive smoking, exposure to household smoke, positive throat culture, persistent rhinorrhea, snoring, allergic and seasonal rhinitis.

Statistical analysis

For a case-control study, data from 156 relatively healthy children included in the control group were used to compare risk factors in 78 children with CSOM. The bi-variant relationship between common risk factors and CSOM was studied using the x^2-square ratio test. Chance ratios with a 95% CI were also calculated. Multiple logistic regression analyzes were performed by including variables that were significant at $p < 0.30$ in the bi-variant analysis. The statistical package R-studio version 3.6.2 was used for the analysis.

3. Results

Socio-demographic indicators of 78 patients and children in the control group (n = 156), as shown in Table 1, are statistically comparable. Risk factors that had a

statistical significance of p <0.30 in bi-variant analysis were subjected to multiple logistic regression analysis. These included age, gender, diet, passive smoking, persistent rhinorrhea, snoring, and seasonal rhinitis. The results of logistic regression analysis showed that persistent rhinorrhea, snoring, seasonal rhinitis and passive smoking are significant risk factors for the development of chronic suppurative otitis media, after adjusting for other socio-demographic variables.

Table 1. Adjusted risk factor analyzes for case-control studies.

Parameters	Main (Chronic suppurative otitis media)		Control group		Adjusted Analysis (Logistic regression)		
	n	%	n	%	Chance ratio	95% CI(confidence index)	value P x2 pearson
Age							
<2 years old	16	20.5	16	10.3	3.0	1.2-7.4	0.01
2-3 years old	19	24.4	31	19.9	1.8	0.82-4.14	0.14
3-4 years old	19	24.4	41	26.3	1.4	0.62-3.08	0.51
4-5 years old	9	11.5	23	14.7	1.2	0.44-3.08	0.74
>5 years old	15	19.2	45	28.8	Comp.	-	-
Gender							
Woman	32	41.0	85	54.5	0.58	0.33-1.00	0.05
Man	46	59.0	71	45.5	Comp.	-	-
SES							
Low	40	51.3	76	48.7	1.1	0.64-1.90	0.74
High	38	48.7	80	51.3	Comp.	-	-

Passive smoking							
Yes	45	57.7	76	48.7	1.4	0.82-2.48	0.19
No	33	42.3	80	51.3	Comp.	-	-
Throat microflora							
Present	41	52.6	74	47.4	1.2	0.71-2.11	0.45
Absent	37	47.4	82	52.6	Comp.	-	-
Household smoke							
Yes	41	52.6	74	47.4	1.2	0.71-2.11	0.45
No	37	47.4	82	52.6	Comp.	-	-
Persistent rhinorrhea							
Present	51	65.4	44	28.2	4.8	2.74-8.76	<0.001
Absent	27	34.6	112	71.8	Comp.	-	-
Snoring and mouth breathing							
Yes	47	60.3	48	30.8	3.41	1.91-6.01	<0. 001
No	31	39.7	108	69.2	Comp.	-	-
Seasonal rhinitis							
Present	57	73.1	50	32.1	5.8	3.1-10.5	<0.001
Absent	21	26.9	106	67.9	Comp.	-	-

The likelihood of developing chronic suppurative otitis media in preschool children was 4.8 times higher in those who had a history of persistent rhinorrhea ($p < 0.01$, CR = 4.8, 95% CI 2.74-8.76). Snoring and mouth breathing are signs that can often be seen in

a child during episodes of persistent rhinorrhea. Therefore, we found that this sign also had a significant association with disease (p = 0.01, CR = 3.41, 95% CI 1.91-6.01). Other important risk factors found in the analysis were seasonal rhinitis and passive smoking. When comparing cases and controls, it was found that seasonal rhinitis (p = 0.001, CR = 5.8, 95% CI = 3.1-10.5) and passive smoking (p = 0.19, CR = 1.4, 95% Cl 0.82-2.48) predispose children to chronic suppurative otitis media, although the association with passive smoking was not statistically significant.

Discussion

Several studies have shown that recurrent upper respiratory tract infections, rather than persistent rhinorrhea, are a risk factor for CSOM [3,7,12]. Despite the use of stricter criteria for rhinorrhea in our study, we found that almost twice as many children with CSOM as compared with the control group had persistent rhinorrhea, which makes it the main risk factor for the development of chronic suppurative otitis media in this population. The importance of persistent rhinorrhea lies in the fact that the persisting discharge in the nasal cavity and nasopharynx forms a suitable environment for the multiplication of pathogenic bacteria, which subsequently enter the middle ear through the Eustachian tube. The association between chronic otitis media, persistent rhinorrhea and bacterial colonization of the nasopharynx has also been noted in previous studies [7].

Symptoms such as snoring and mouth breathing are usually associated with persistent rhinorrhea. Some scientists [4,9] have found that CSOM is more common in children who snore. This relationship was also found in our study (p <0.01, CR = 3.41, 95% CI 1.91-6.01). Enlarged, obstructive adenoids and tonsils are a common cause of snoring. Therefore, reducing the risk of developing chronic suppurative otitis media involves evaluating and treating these conditions in children with snoring.

In the present study, a child exposed to passive exposure to cigarette smoke was approximately 1.4 times more likely to develop chronic suppurative otitis media than an untreated child. To assess this risk factor, a history of exposure to cigarette smoke was obtained from the parents. The effect of cigarette smoke is paralysis of the cilia and damage to the epithelium of the airways, making it more prone to bacterial infections. This, in turn, can lead to persistent rhinorrhea and subsequent otitis media. While there are many anti-tobacco campaigns and advertisements in the country highlighting the carcinogenic effects of smoking, there is little national awareness that

passive smoking can negatively affect the respiratory and otological health of a growing child.

Some authors [2,6,8] believe that seasonal rhinitis is an important risk factor for the development of chronic suppurative otitis media. The onset of winter usually foreshadows the appearance of upper respiratory tract infections in children. Many of these are viral infections, although some may be seasonal allergies. In this population, seasonal rhinitis was an important risk factor for the development of chronic suppurative otitis media ($p = 0.02$, CR = 5.8, 95% CI 3.1-10.5). Many children with seasonal rhinitis in this study reported exposure to passive smoking ($p < 0.001$, CR = 4.9, 95% CI 2.7-9.6).

A possible flaw in this study includes the so-called 'recall bias', as the data were not collected at the time the risk factor was present and this may have influenced the results to varying degrees.

Treatment of enlarged adenoids, chronic sinusitis and underlying nasal allergies is necessary to reduce the problem of persistent rhinorrhea. Regular school and camp visits to screen children for persistent rhinorrhea, shortness of breath and otitis media should be part of a dedicated national ear health program.

Conflict of interest

The authors have not identified any conflicts of interest.

The role of funding sources

Did not have.

Acknowledgments and confessions

The authors are grateful to Dr. IbragimovKh.I. for assistance and help in organizing, conducting and analyzing this study.

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