

The association of allergy and chronic suppurative otitis media: A study in a tropical country

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ABSTRACT

Objective: Chronic suppurative otitis media (CSOM) usually begins as a spontaneous perforation of tympanic membrane due to an acute infection of the middle ear. This study was aimed to evaluate the association between allergy and CSOM.

Methods: A case-control study was carried out among patients with CSOM (cases) and controls were those with no ear pathology. The presence of CSOM was made through a medical history and otoscopic examination. Allergen testing was done by the skin prick test.

Results: In all 124 subjects were recruited in this study with equal number of the cases and controls. The commonest positive reaction in the skin prick test in both groups was to house dust mites. Among CSOM cases, half (50%) of them had an allergy to *Blomia tropicalis* and 48.4% to *Dermatophagoides* while in the control group, 27.4% to *Dermatophagoides* and 25.8% to *B. tropicalis*. There were significant associations between CSOM and allergy to *B. tropicalis* ($p=0.005$), *Dermatophagoides* ($p=0.016$) and *Felis domesticus* ($p=0.040$). The prevalence of allergy at 95% confidence interval (95%CI) in CSOM and control groups were demonstrated as 59.7% (95%CI: 47.5, 71.9) and 30.6% (95%CI: 19.1, 42.1) respectively. There was a significant association between allergy and CSOM ($p=0.001$).

Conclusion: Indoor allergens are the most prevalent in our environment and therefore good control may difficult to achieve. The hypersensitivity states of the subject are likely to have a role in the pathogenesis of CSOM especially in the tropical countries where allergy occurs perennially.

KEY WORDS:

Allergy; suppurative otitis media; hearing loss

INTRODUCTION

Chronic suppurative otitis media (CSOM) is one of the most common chronic infectious diseases worldwide especially in developing countries.¹ It is the second most common middle ear disease in children causing hearing impairment, and this may affect their academic performance.² Furthermost lines for treatment have been unsatisfactory, too costly and problematic.

CSOM usually begins in childhood as a spontaneous perforation of the tympanic membrane due to acute otitis media.³ Although there is a possibility of the tympanic membrane healing in some cases, many patients develop either recurrent episodes of ear discharge which is called active CSOM or a dry but permanent tympanic perforation known as inactive CSOM. Upper respiratory tract infection (URTI) is often the cause of otorrhea, especially in children. Infection of the middle ear because of swimming or bathing is the other reason of intermittent otorrhea. Thus, it is difficult to treat the chronic draining ear in CSOM.⁴

Despite being prevalent, many of the facts about the pathogenesis of CSOM are not understood and also its optimal management. It seems that the pathogenesis of CSOM is multifactorial, and the most relevant factor in the evolution of this disorder is supposed to be the dysfunction of the Eustachian tube.^{1,5}

Allergic diseases are related to many factors and may involve environmental and genetic components.⁶ Although allergic rhinitis has an illustrious important effect on the function of Eustachian tube, there is still a lack of evidence on the effect of the allergic rhinitis in the development of CSOM.¹ This study was carried out to evaluate the association between allergy and CSOM.

MATERIALS AND METHODS

This is a case-control study done at the School of Medical Sciences, Health Campus, Universiti Sains Malaysia, Kelantan. Cases were patients under regular otorhinolaryngology clinic follow up for CSOM and the clerical staff with no ear pathology were recruited as the control group. Patients who were younger than 15 years old were excluded as they may not cooperate for the skin prick test. Patients with cholesteatoma, individuals who have taken antihistamines within 72 hours before the skin prick test and individuals who had taken anti depression drugs or H2 receptor antagonists were also excluded from the study.

The sample size (n) was estimated based on the proportion of allergy in the control group at 33.0% and among the study group at 60.0%.⁷ The calculation indicated that a minimal sample size of 51 subjects would be sufficient for each group to detect the difference between the two study groups with the

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Table I: Demographic profiles of the subjects (n=124)

Variables		Cases (CSOM) (n=62)		Control (n=62)	
		Mean (SD)	Freq (%)	Mean (SD)	Freq (%)
Gender	Male	33.6 (17.3)	22 (35.5)	41.8 (11.2)	19 (30.6)
	Female		40 (64.5)		43 (69.4)
Age					
Ethnic	Malay		52 (83.9)		55 (88.7)
	Chinese		9 (14.5)		4 (6.5)
	Indian		1 (1.6)		3 (4.8)

Note: CSOM – Chronic Suppurative Otitis Media

Table II: Comparison of allergen types in association with the presence of chronic suppurative otitis media (CSOM)

Allergen type	Allergen	Cases (CSOM) Freq (%)	Controls Freq (%)	p-value
Negative control	Normal Saline	0	0	^a
Animal allergen	<i>Felis domesticus</i>	10 (16.1)	3 (4.8)	0.040
Food allergen	Egg yolk	3 (4.8)	0	0.244
Food allergen	Chicken meat	2 (3.2)	0	0.496
Food allergen	Peanut	2 (3.2)	2 (3.2)	>0.950
Food allergen	Wheat flour	3 (4.8)	1 (1.6)	0.365
Mites allergen	<i>Blomia tropicalis</i>	31 (50.0)	16 (25.8)	0.005
Mites allergen	<i>Dermatophagoides</i>	30 (48.4)	17 (27.4)	0.016
Pollen allergen	<i>Cynadon dactylon</i>	2 (3.2)	4 (6.5)	0.680
Mould/yeast	<i>Mucor muceda</i>	4 (6.5)	2 (3.2)	0.680
Positive control	Histamine	62 (100)	62 (100)	^b

a, b: No statistics were computed.

Table III: The prevalence of allergy in chronic suppurative otitis media (CSOM) and control groups

	Percentages (95% CI)
Cases (CSOM)	59.7 (47.5, 71.9)
Control	30.6 (19.1, 42.1)

Table IV: The association between allergy and chronic suppurative otitis media (CSOM)

Group	n	Allergic Freq (%)	Non-allergic Freq (%)	X ² stat. (df)	p-value
Cases (CSOM)	62	37 (59.7)	25 (40.3)	10.55 (1)	0.001
Control	62	19 (30.6)	43 (69.4)		

power of 80% and type I error of 0.05. Thus, with anticipation of 20% non-response rate, we decided to enrol 62 subjects for each study group giving a total of 124 subjects.

The presence of CSOM was established through medical history and otoscopic examination. Skin prick test for allergy, was done using a skin prick test set (ALK-Abello, Spanish). The allergens included in the set were animal allergen (*Felis domesticus*), food allergens (egg yolk, chicken meat, peanut and wheat flour), house dust mites (*Blomia tropicalis* and *Dermatophagoides*), pollen (*Cynadon dactylon*) and mould (*Mucor mucedo*).

Histamine was used as a positive control while normal saline as a negative control. The evaluation was done after 15 minutes and if the diameter of the wheal was 3mm larger than the negative control that was considered as a positive result. Positive allergy was proved by positive reaction at least to one of the listed allergens.

Data was entered and analysed by using SPSS software (Statistical Package Social Science) version 18.0 for windows. Descriptive statistics such as means and standard deviation (SD) for continuous variables whereas, frequency and percentage for categorical variables were performed. The prevalence of allergy in CSOM and control group were calculated at 95% confidence interval (95%CI). The Chi-square test was done to determine the association between the allergen types and the presence of CSOM as well as between the presence of allergy and CSOM. The p value was set as significant at $p=0.05$.

This study was approved by the Research and Ethics Committee of our institution (USMKK/PPP/JEPeM[241.3.(10)]).

RESULTS

Demographic profiles of the 124 subjects and controls is shown in Table I. The mean age for CSOM cases and control group were 33.6 (SD=17.3) and 41.8 (SD=11.2) years respectively. The majority of them were Malay followed by Chinese and Indian. This reflects the actual racial composition in Kelantan.

Table II shows the comparison of allergen types in association with the presence of CSOM. The commonest positive reaction in both groups was to *Blomia tropicalis* and *Dermatophagoides* which is commonly known as the house dust mite. Among CSOM cases, half (50%) of them had an allergy to *B. tropicalis* and 48.4% developed a positive reaction to *Dermatophagoides*. In the control group positive result to *Dermatophagoides* and *B. tropicalis* were noted in 27.4% and 25.8% of the cases respectively.

Besides, the proportion of all used allergens were noted to be more in CSOM group compared with controls except for peanuts and *C. dactylon*.

According to our statistical analysis, significant association between CSOM and allergy to *B. tropicalis* ($p=0.005$),

Dermatophagoides ($p=0.016$) and *F. domesticus* ($p=0.040$) were noted. The other allergens did not show significant associations.

In this study, 37 of the 62 patients in CSOM group had a positive skin prick test. As shown in Table III, the prevalence of allergy at 95%CI in CSOM and control groups were demonstrated as 59.7% (95%CI: 47.5, 71.9) and 30.6 % (95%CI: 19.1, 42.1) respectively. Table IV shows that there is a significant association between allergy and CSOM ($p=0.001$).

DISCUSSION

In the past, the pathogenesis of CSOM was considered to be the chronic stage that follows acute otitis media (AOM). However, in many cases, patients often presented with no previous history of AOM. Some otologists consider that there is a relationship between CSOM and persistent otitis media with effusions (OME). The degeneration of the lamina propria of the tympanic membrane in OME could have caused the formation of the perforation.

It seems that the pathogenesis of CSOM is multifactorial, and the more relevant factor in the evolution of this disorder is supposed to be the dysfunction of the Eustachian tube. Thus, allergy may contribute to the problem. Inflammation of nasal mucosa propagates directly to the nasopharyngeal mucosa and consequently leads to oedema of the opening of the Eustachian tube. Nasal obstruction may also cause negative pressure in nasopharynx leading to the obstruction of Eustachian tube. Both effects result in the development of the negative middle ear pressure.

The present study showed that the commonest allergen in our population was house dust mite, followed by animal allergen. Therefore, allergy occurs perennially in most of our patients. Good long-term adherence to a therapeutic regimen by patients is crucial to determine the success of the treatment but this is not easily achieved. The uncontrolled allergy may have contributed to the development of CSOM in our patients.

Skin prick test was applied to evaluate the presence of allergy in our subjects, because many publications accept the skin prick test as a gold standard for confirmation of allergy.⁸ Chinoy et al., described the skin prick test as a common screening method for assessment of allergy which is superior to specific IgE assays in identifying sensitization to specific allergens.⁹ In addition to its global efficiency, skin prick test was chosen because it is easy to conduct, cheap and capable to delivering the results within a few minutes.¹⁰

In this current study, we attempted to survey the fact in an organized manner by applying of strict criteria for CSOM and allergy. The prevalence of allergy in our study among CSOM group was shown as 59.7 %. Compared with prevalence of allergy in control cases (30.6%), which were selected from the general population, there was a significant difference between them. Besides, the prevalence of all used allergens were noted to be more in CSOM group compared with controls except for peanuts and *C. dactylon*. This study

revealed a significant association between the presence of CSOM and allergy to house dust mites and animal (cat) allergen. Therefore, our study showed that the hypersensitivity can be considered as an important risk factor that contributes to the pathogenesis of CSOM.

Lasisi et al., found some evidence of hypersensitivity in 16 out of 20 CSOM children.⁷ The authors believed that the presence of allergy in 80% of CSOM cases indicates a considerable role of hypersensitivity in CSOM. The percentage seems to be very high but was comparable with the results achieved by Alles et al., about the relation of allergy and otitis media effusion.¹¹ Nevertheless, they recommended for additional studies to be done to establish the effect of allergic states in pathogenesis of CSOM. In contrast to our study Lasisi et al., selected children. As we know, the pathogenesis of CSOM can be initiated at earlier ages and present during later in life. In our study, the participants younger than 15 years old were excluded, because they may not cooperate for the skin prick test. Furthermore, Lasisi et al., did not report about the types of allergens involved in their subjects.⁷

Lanphear et al., and Bernstein conducted a series of clinical and experimental studies that showed the treatment of allergy considerably improves the condition of otitis media in the cases of suppurative otitis media with evidences of allergy.^{12,13} Hurst also stated that specific allergy immunotherapy for the patients with allergy and middle ear effusion, is able to improve and resolve the middle ear disease significantly.¹⁴ This efficacy of treatment may develop a risk predictor of CSOM in association with allergy. Putting it differently, those who control their allergy well may prevent themselves from getting CSOM.

In contrast, Bakhshae et al., in their study in Iran revealed a non-significant difference between the two groups ($p=0.43$) even though they found a higher prevalence of allergic rhinitis in CSOM cases (29.41%) than the control subjects (22.28 %).¹ However, unlike in our study population, their patients were exposed to outdoor allergens as the most prevalent with low prevalence for indoor allergens. In other words, their allergy was seasonal or intermittent in nature but was perennial for our region. Caraballo et al., in their review have supported that epidemiologic differences between the tropics and temperate zones deserves special attentions from the scientific community.¹⁵

CONCLUSION

Indoor allergens are the most prevalent in our population and therefore a good control may be difficult to achieve. The hypersensitivity states of people are likely to have a role in the pathogenesis of CSOM especially in the tropical countries where allergy occurs perennially. We advocate to take a detail history of allergy in all patients with CSOM and appropriate anti-allergic treatment be given to those who are found positive for allergens.

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