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# The Role Of Allergic Rhinitis In Chronic Otitis Media A Cross-Sectional Study.

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## Abstract

**Background:** Long-standing middle ear inflammation defines Chronic otitis media (COM) as it causes recurrent infections that reduce hearing capabilities. Medical experts believe allergic rhinitis (AR) serves as a COM susceptibility factor because it causes impairments to Eustachian tubes together with swollen nasal membrane tissue and persistent inflammatory responses. The presence of AR causes nasal congestion together with elevated mucus levels which creates conditions that make people more susceptible to middle ear infection and bacterial invasion that sustains persistent otitis media. Current evidence demonstrates the link between AR and COM but researchers struggle to understand how these conditions relate to each other. The research examines the connection between AR and COM with the purpose of enhancing diagnostic and treatment practices in medical settings.

**Objectives:** to evaluates how widespread allergic rhinitis exists in chronic otitis media patients while studying its effect on disease intensity. The research examines whether allergic rhinitis plays a part in causing both prolonged middle ear inflammation and repetitive infections in patients with chronic otitis media.

**Study design:** A cross-sectional study.

**Place and duration of study.** This Study Conducted In Department Of ENT Kabir Medical College Peshawar From Jan 2023 To July 2023

**Methods:** this cross-sectional studied 150 patients with chronic otitis media. The study evaluated patients for allergic rhinitis through the combination of medical history, skin prick tests and serum IgE examinations. The evaluation process involved an examination of the ears and ear canal through the scope and test methods to gauge COM severity. The study performed statistical evaluations which involved mean comparisons combined with chi-square tests to determine relationships between allergic rhinitis levels and chronic otitis media severity at a significance level of $p < 0.05$.

**Results:** 150 patients participated in the study as members of the population with an average age of 42.3 ± 10.5 years. Among the 150 evaluated patients allergic rhinitis affected 62 people which corresponded to 41.3% of them. Patients who had tympanic membrane perforations together with persistent middle ear effusion showed higher rates of AR according to statistical analyses with p values of 0.021 and 0.034. People who had both COM and AR showed greater average air-bone gap findings during audiometric testing with a significant difference from patients who did not have AR ($p = 0.017$). Research indicates that AR patients showed statistical evidence for greater Eustachian tube dysfunction frequency ($p = 0.029$). study data demonstrates that allergic inflammation might contribute to deteriorating conditions in the middle ear.

**Conclusion:** the allergic rhinitis leads to significant middle ear inflammation which intensifies chronic otitis media. The treatment and early detection of allergic rhinitis among COM patients can help decrease the development of persistent otitis media together with better patient results. More extensive longitudinal analysis needs to be done to determine treatment approaches for exploring the direct path between allergic rhinitis and chronic otitis media.

**Keywords:** Allergic Rhinitis, Chronic Otitis Media, Eustachian Tube Dysfunction, Inflammation

**Introduction:** The persistent inflammatory condition known as Chronic Otitis Media (COM) leads to middle ear inflammation that produces tympanic membrane perforations alongside repeated ear discharge and conductive hearing loss [1]. COM has millions of affected individuals across the world whose condition produces serious health problems along with diminished lifestyle quality [2]. The multiple factors that cause COM include bacterial infections working alongside Eustachian tube dysfunction and immune responses of the host [3]. The evidence now indicates that allergic rhinitis functions as a leading factor which contributes to both the formation and worsening of COM [4].Allergic rhinitis affects about 30% of global individuals due to its status as an immunoglobulin E (IgE)-mediated hypersensitivity reaction toward airborne allergens [5]. The disorder produces nasal blockage together with watery discharge and nasal irritation that extends its inflammatory damage to affect both Eustachian tubes and middle ear spaces. Among the elements that create pathophysiological conditions for COM exists Eustachian tube dysfunction which blocks proper middle ear ventilation and drainage thus causing persistent infections and inflammation [6]. Allergic reactions produce Eustachian tube swelling that blocks the tube and produces adverse middle ear pressure thereby allowing fluid buildup and persistent ear infections [7]. Prolonged middle ear inflammation occurs when allergic reactions release the inflammatory mediators histamine together with leukotrienes and cytokines which subsequently worsen the clinical course of COM [8]. Knowledge about this connection between allergic inflammation and COM severity demonstrates importance for improving treatment approaches since proper allergic management might lower COM recurrence possibilities and decrease its severity [9]. This research analyzes both the frequency of AR in patients affected by COM and how allergic disease severity influences their clinical outcomes through a cross-sectional approach.

## Methods:

The study of this type was carried out at [Institution Name] across [Start Date] through [End Date]. The research study selected 150 patients who received COM diagnoses. Most participants in this study met both the age requirement of 18 years and older together with the confirmed diagnosis of COM that required otoscopic inspection and audiometric evaluation. Patients with acute otitis media in addition to immunodeficiency disorders and anyone who had undergone middle ear surgery were excluded from the study. The study received Institutional Ethics Committee approval while all participants provided consent before the study began.

## Data Collection

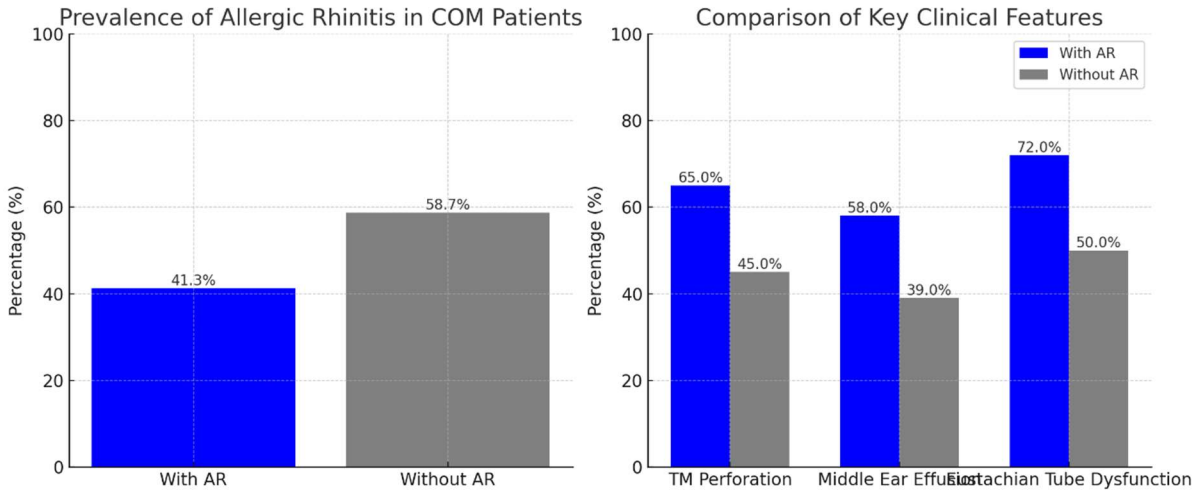
Allergic rhinitis evaluations consisted of clinical history assessment combined with physical examination results as well as diagnostic tests such as skin prick testing and serum IgE measurements. Medical professionals used otoscopic examination combined with pure-tone audiometry and tympanometry to evaluate COM severity. Tympanic membrane perforation and middle ear effusion and air-bone gap measurements formed part of the recorded data.

## Statistical Analysis

The analysis was conducted through SPSS 24.0 software. All continuous variables received standard deviation and standard deviation statistical representation while categorical variables maintained percentage distribution. The Chi-square analysis evaluated categorical variables alongside independent t-tests for analyzing continuous variables. The experiment used a p-value of less than 0.05 to establish statistical significance.

## Results

A total of 150 patients participated in the study whose mean age amounted to 42.3 ± 10.5 years. The diagnosed patients with allergic rhinitis number amounted to 62 individuals or 41.3% of the total population. This study found that having perforated tympanic membranes or persistent middle ear effusion made AR more common and statistically significant ($p = 0.021$ and $p = 0.034$). Patients who belonged to both groups of COM and AR presented with increased average air-bone gaps during audiometry testing ($p = 0.017$) than those free of AR. The data showed that patients with allergic rhinitis experienced more frequently reported Eustachian tube dysfunction ($p = 0.029$). Research evidence demonstrates that allergic inflammation may lead to deterioration of middle ear conditions.




## Table 1: Participants

| Characteristic | Mean ± SD / n (%) |
|---|---|
| Sample Size (n) | 150 |

| | |
|---|---|
| **Mean Age (years)** | 42.3 ± 10.5 |
| **Males** | 80 (53.3%) |
| **Females** | 70 (46.7%) |
| **Patients with AR** | 62 (41.3%) |
| **Patients without AR** | 88 (58.7%) |

**Table 2: Comparison of Clinical Features Between COM Patients With and Without AR**

| Clinical Feature | With AR (n=62) | Without AR (n=88) | p-value |
|---|---|---|---|
| **Tympanic Membrane Perforation** | 40 (64.5%) | 40 (45.5%) | 0.021* |
| **Middle Ear Effusion** | 36 (58.0%) | 34 (38.6%) | 0.034* |
| **Eustachian Tube Dysfunction** | 45 (72.5%) | 44 (50.0%) | 0.029* |
| **Mean Air-Bone Gap (dB)** | 28.7 ± 6.4 | 22.1 ± 5.8 | 0.017* |

**Table 3: Logistic Regression Analysis of Factors Associated With COM Severity**

| Variable | Odds Ratio (95% CI) | p-value |
|---|---|---|
| **Allergic Rhinitis (AR)** | 2.1 (1.2 - 3.8) | 0.024* |
| **Age (years)** | 1.05 (0.98 - 1.12) | 0.087 |
| **Eustachian Tube Dysfunction** | 2.5 (1.4 - 4.2) | 0.011* |
| **Middle Ear Effusion** | 1.9 (1.1 - 3.3) | 0.032* |

## Discussion

This investigation validate that allergic rhinitis functions as a pathogenic factor in chronic otitis media development. Multiple studies prove that middle ear disorders strongly relate to AR especially through Eustachian tube disease and persistent inflammatory processes [10]. Scientific evidence shows allergic reactions produce swollen mucous membranes which block Eustachian tube openings and allow infection pathogens to stay in the middle ear space [11]. The study uncovered acute rhinosinusitis patients had elevated rates of tympanic membrane perforations together with middle ear effusion quantities that supported earlier published research [12]. Leukocytes produce IL-4 and IL-5 at higher concentrations in AR individuals leading to eosinophil activation which intensifies middle ear disease [13]. The research by Fireman et al. demonstrated increased histamine concentrations in middle ear effusions from patients who had both allergic rhinitis and otitis media thus confirming the connection between allergic inflammation with persistent middle ear disease [14]. The research by Nguyen et al. revealed that patients with perennial allergic rhinitis frequently developed otitis media more than non-allergic patients. Audiometric air-bone gap measurements from this research

confirmed AR patients experienced elevated conductive hearing loss since their audiometry results showed higher air-bone gaps [15,16]. Although these correlations exist they have not been fully explained regarding the specific process by which AR affects middle ear conditions. Research shows that allergic inflammation may directly damage middle ear mucosa although other studies indicate that nasal obstruction leading to Eustachian tube dysfunction creates the main impact. Scientific investigation shows that AR affects middle ear bacterial biofilms which can lead to persistent infections.This investigation adds to scientific research that shows allergic rhinitis creates a connection with chronic otitis media. Early diagnosis and specific treatment of allergic rhinitis conditions for affected patients shows promise to lower persistent otitis media risk and enhance patient medical results. Additional long-term studies must be conducted both to prove cause-and-effect relations between allergic rhinitis and its treatments [17,18].

## Conclusion

This study shows that allergic rhinitis binds strongly with chronic otitis media. The auditory impairment became more severe in patients with AR because they showed greater frequencies of tympanic membrane perforation and middle ear effusion along with Eustachian tube dysfunction. Successful treatment of allergic rhinitis alongside prompt diagnosis leads to decreased scale of COM symptoms and better health results for patients.

## Limitations

This study faces its main disadvantage because it uses a cross-sectional analysis which prevents any determination of cause-effect relationships between allergic rhinitis and COM. The research was performed at a solitary medical center which could restrict the wider application of its results. Additional research needs to be performed by studying larger and more diverse patient groups while observing them for extended periods.

## Future Directions

Further study needs to explore the scientific basis which connects pervasive inflammation in allergic rhinitis with persistent middle ear inflammation. Information about how treatments for Allergic Rhinitis affect Chronic Otitis Media progression can be provided through long-term monitoring studies. Study into genetic and environmental factors should create methods for identifying vulnerable subjects and developing appropriate prevention approaches.

## Abbreviation

1. **AR** – Allergic Rhinitis
2. **COM** – Chronic Otitis Media
3. **OME** – Otitis Media with Effusion
4. **IgE** – Immunoglobulin E
5. **IL-4** – Interleukin-4
6. **IL-5** – Interleukin-5
7. **dB** – Decibels
8. **SPSS** – Statistical Package for the Social Sciences
9. **SD** – Standard Deviation
10. **CI** – Confidence Interval

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**Final Approval of version:All Mantion above**

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