

# Evaluation of Conductive Hearing Loss in Patients with Nasopharyngeal Obstruction in a Tertiary Care Setup of Karachi

Sana Mehfooz<sup>1</sup>, Areej Iqrar<sup>2</sup>, Zeba Ahmed<sup>3</sup>, Tariq Zahid Khan<sup>4</sup>, Rajesh Kumar Vasandani<sup>5</sup>, Tehmina Junaid<sup>6</sup>

## Abstract

**Objective:** To evaluate the frequency and severity of conductive hearing loss in patients with nasopharyngeal obstruction, admitted in tertiary care setup of Karachi.

**Methods:** It was a descriptive cross-sectional type of study. The study was conducted in the department of otorhinolaryngology and head and neck surgery Dr. Ruth K. M. Pfau, Civil Hospital, Karachi. The study continued for 6 months from September 8<sup>th</sup>, 2021, to March 8<sup>th</sup> 2022. Both males and females were included in the study, with ages ranging between 15 and 40 years. The data was collected using a questionnaire. Questions were asked to all the patients with nasal/nasopharyngeal obstructive pathologies who were admitted in the ENT ward for different managements, including their gender, age, cause and duration of nasal/ nasopharyngeal obstruction. Assessment of degree and type of hearing loss was done using Pure Tone Audiogram (PTA). Data analysis done using SPSS version 23.

**Results:** - The patients' average age was  $28.23 \pm 8.23$  years. All patients with nasopharyngeal blockage suffered from conductive hearing loss (100%). The degree of conductive hearing loss in patients with nasopharyngeal blockage was mild loss in 51 (52.58%), moderate loss in 36 (37.11%), moderately severe loss in 9 (9.28%), and severe loss in one (1.03%).

**Conclusion:** This study suggests that there is a strong link between obstructive nasal and/or nasopharyngeal lesions and conductive hearing loss. If the study could be conducted on a larger scale, the role of eustachian tube obstruction in the formation and disease course of otitis media would become clearer, and its management would be more beneficial in the treatment of otitis media.

**Key Words:** Otitis media, hearing loss, nasopharyngeal obstruction

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## Introduction

Otitis media with effusion (OME) is the collection of mucoid or serous fluid in the middle ear cleft in the absence of acute inflammation. It is the leading cause of curable deafness among children around the world<sup>1</sup>. The functions of Eustachian tube are to aerate the middle ear, to drain mucoid secretions and to equalize pressure between the middle

ear and the atmosphere<sup>2</sup>. Pathological conditions pertaining to the nasopharynx, including nasopharyngeal cysts, juvenile nasopharyngeal angiofibroma (JNA), nasopharyngeal carcinoma (NPC), although rarely reported, are associated with Eustachian tube dysfunction. When the lesions become large, they present with manifestations like hearing impairment and conductive hearing loss due to middle ear effusion from mechanical blockade of the pharyngeal opening of Eustachian tube<sup>3</sup>. Nasal obstruction causes mouth breathing and malocclusion<sup>4</sup>, the sequelae of which include chronic bronchitis and upper respiratory tract infections. All of these also lead to Eustachian tube malfunction<sup>5</sup>.

<sup>1</sup> Sindh Institute of Urology and Transplantation, Karachi

<sup>2</sup> Fazaia Ruth Pfau Medical College

<sup>3-6</sup> Dr. Ruth K. M. Pfau, Civil, Hospital Karachi

**Correspondence:** Sana Mehfooz  
Sindh Institute of Urology and Transplantation, Karachi  
Email: sanamehfooz17@gmail.com  
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The dysfunction of the Eustachian tube causes a range of middle ear disorders over time. These may include tympanic membrane retraction, conductive hearing loss, or chronic suppurative otitis media with consequences. A cycle of nasal obstruction, persistent inflammation, and pathogens accessing the middle ear due to Eustachian tube dysfunction results in recurrent otitis media and otitis media with effusion<sup>4</sup>. When these symptoms persist over an extended period of time, they might lead to impaired or delayed speech, particularly in younger population.

Patients with OME frequently appear with symptoms such as hearing loss or auditory fullness, but do not experience discomfort or fever. Hearing impairment in children is typically minor, passes unreported, and can only be detected with an audiogram. A type of otitis media with effusion called serous otitis media, in which transudate forms as a result of a fast fall in middle ear pressure relative to air pressure. In this scenario, the fluid is both watery and transparent<sup>6</sup>.

It is critical to differentiate between middle ear infections and OME<sup>7</sup>. Otitis media is a generic word that refers to middle ear inflammation without a specific cause or pathogenesis. Because all pneumatized areas of the temporal bone communicate with one another, otitis media may affect three more regions: the mastoid air cells, peri labyrinthine air cells, and the petrous apex. As a result, otitis media encompasses a range of associated disorders, including acute otitis media (AOM), otitis media with effusion, recurrent acute otitis media (RAOM), and chronic otitis media (COM)<sup>8</sup>.

Unlike acute otitis media, OME has got fewer complications due to absence of inflammation. As mentioned previously, the most dreadful complication of it is hearing loss and the resulting speech delay especially in children. Nonetheless, the stasis of secretions in middle ear provide a medium for bacterial growth and hence result in development of recurrent acute otitis media, which is also a serious complication of OME.

Otitis media with effusion can also be caused by an obstruction in the pharyngeal aperture of the Eustachian tube. It is most commonly documented in individuals with cleft lip and palate, as well as children with Down syndrome and other palate-related illnesses. Furthermore, increased mucus viscosity and impaired mucociliary clearance in cystic fibrosis patients have been linked to a higher prevalence of otitis media with effusion.

Studies have been conducted in order to develop a relation between nasopharyngeal obstructive states and hearing impairment. There are two major types of hearing impairment. Conductive and sensorineural. It was found out that 50% individuals had conductive type of hearing loss, and out of them 19% of them had OME<sup>9</sup>, the most frequent condition in patients with nasopharyngeal obstruction causing hearing loss. Epidemiological data also explains that the most common cause of transient hearing loss in children is tympanic effusion<sup>10</sup>. Hypertrophic adenoid is one of the major causes of OME in children<sup>11</sup>. With increase in adenoid size, chances of development of fluid in middle ear increase, which cause diminished hearing in children younger than 12 years. Enlarged adenoids as a cause of nasopharyngeal obstruction is a significant risk factor of OME in children<sup>12</sup>. Although adenoid hypertrophy is a major factor in causing middle ear effusion, its location or size has little or no effect on hearing threshold<sup>13</sup>. In 2010, van den Aardweg MT<sup>14</sup> conducted a study which showed that adenoidectomy had a significant role in resolution of OME, but little effects on hearing were seen. OME has adverse effects on hearing sensitivity and speech perception in children<sup>15</sup>. Furthermore it causes conductive hearing loss in individuals that is of mild to moderate severity<sup>16</sup>.

Information regarding the relationship between hearing loss and other nasopharyngeal obstructive disorders is scarce. Furthermore, there is a lack of information regarding the age groups and pathologies that lead to greater rates of deafness.

The study aimed to evaluate conductive hearing loss in nasopharyngeal obstructive conditions. The degree of impairment was assessed. Such disease

states must be treated at earliest with appropriate surgical and/or medical therapy in order to avoid hearing loss and development of its complications.

### Methodology

This was a descriptive cross-sectional research. The study was carried out at the Department of Otorhinolaryngology and Head & Neck Surgery, Dr. Ruth K. M. Pfau, Civil Hospital in Karachi. It ran for six months, from September 8th, 2021 until March 8th, 2022.

According to a study conducted by Musani MA [10], around 50% of patients experienced conductive hearing loss. Using a 10% margin of error and a 95% confidence level, the projected sample size was 97. The sample size was obtained using the WHO sample size calculator.

The study employed non-probability consecutive sampling. The study comprised both male and female participants. The age range picked was 15 to 40 years. The study comprised patients who were admitted with nasal and nasopharyngeal obstructive disorders (nasopharyngeal cysts, nasal polyps, juvenile nasopharyngeal angiofibroma, and nasopharyngeal cancer) as well as otitis media with effusion confirmed by tympanometry.

Patients who had previously undergone ear surgery, had ear illnesses other than otitis media with effusion, had recent upper respiratory tract infections, or did not grant consent to participate were excluded from the study.

The data was collected using a questionnaire. Questions were asked to all the patients with nasal/nasopharyngeal pathologies admitted in ENT ward, Dr. Ruth K. M. Pfau, Civil Hospital Karachi. In the questionnaire, we asked the name, age and gender of the patients. The duration of nasopharyngeal obstruction was asked. Assessment of hearing loss using Pure Tone Average (PTA) was done. The research was proceeded after acceptance from the institute's ethical committee.

The data was analyzed using the software SPSS version 23. Descriptive statistics like mean standard deviation was computed for age and dura-

tion of conductive hearing loss. For continuous variables, frequency and percentages were computed for gender, diagnosis, conductive hearing loss and categories of conductive hearing loss for different degrees. For categorical variables, effect modifiers like age, gender, duration of nasopharyngeal obstruction, diagnosis were addressed through stratification. Post stratification inferential statistics were used to compare with the categorical variables using chi square test and fisher exact test were applied. p-value  $\leq 0.05$  was considered as significant.

### Results

The study comprised 97 patients who complained of nasal and nasopharyngeal obstruction. Based on their age, the patients were divided into three groups. Patients in group I ranged in age from 15 to 20, patients in group II from 21 to 30, and patients in group III from 31 to 40 years old. The calculated average age of the patients was  $28.23 \pm 8.23$  years.

The length of a patient's symptoms was used to stratify the patients. Those with nasal and/or nasopharyngeal obstruction for longer than five months were classified as Group A, while those with symptoms for longer than five months were classified as Group B. 55.67% of the population was male, while 44.33% was female. Based on severity, conductive hearing impairments are categorized as mild (below 40 dB), moderate (41–55 dB), moderately severe (55–70 dB), and severe (above 70 dB).

A variety of nasopharyngeal obstructive disorders were noted in the patients, including benign tumors of the nasopharynx, fungal rhinosinusitis, juvenile nasopharyngeal angiofibroma, nasopharyngeal cancer, antrocoanal polyps, and allergic nasal polyp, which affected 40(41.2%) patients. Other common nasopharyngeal obstructive diseases included fungal rhinosinusitis 32(33%), antrocoanal polyp 12(12.4%), juvenile nasopharyngeal angiofibroma 8(8.2%), nasopharyngeal carcinoma 3(3.1%), one case of parapharyngeal space pleomorphic adenoma (1%) and giant cell granuloma of maxilla (1%) each.

All patients with nasal and /or nasopharyngeal obstruction were found to have conductive hearing loss (100%). The severity of conductive hearing loss was mild in 51(52.58%) patients, 36(37.11%) patients had moderate loss, 9 (9.28%) patients had

moderately severe and 1(1.03%) had severe loss. Severity of conductive hearing loss was statistically significant among age groups (p=0.011) as shown in table no.1. It was not statistically significant between genders. Stratification with respect to diagnosis was reported in table 2.

**Table 1.** Relation of severity of conductive hearing loss in nasopharyngeal obstructive states with age groups, duration of obstruction and gender (n=97)

		Severity of conductive hearing loss				p- value
		Mild loss	Moderate loss	Moderately severe loss	Severe loss	
Age (in years)	Group I(15-20 years)n=24	18 (75%)	4 (16.7%)	1 (4.2%)	1 (4.2%)	0.01
	Group II(21-30 years)n=36	19 (52.8%)	16 (44.4%)	1 (2.8%)	Nil	
	Group III(31-40 years)n=37	14 (37.8%)	16 (43.2%)	7 (18.9%)	Nil	
Duration of nasopharyngeal obstruction (In months)	Group A(<5 months)n=42	23 (54.8%)	13 (31%)	5 (11.9%)	1 (2.4%)	0.4
	Group B(>5 months)n=55	28 (50.9%)	23 (41.8%)	4 (7.4%)	Nil	
Gender	Male n=54	27 (50%)	23 (42.6%)	4 (7.4%)	Nil	0.4
	Femalen=43	24 (55.8%)	13 (30.2%)	5 (11.6%)	1 (2.3%)	

**Table 2.** Nasopharyngeal obstructive states and its relation with the degree of hearing loss.

	Severity of conductive hearing loss (in dB)				p- value
	Mild loss	Moderate loss	Moderately severe loss	Severe loss	
Allergic Nasal Polyps n=40/97	23 (57.5%)	14 (35%)	3 (7.5%)	Nil	0.9
Antrocoanal Polypsn =12/97	8 (66.7%)	4 (33.3%)	Nil	Nil	0.6
Fungal Rhinosinusitish =32/97	11 (34.4%)	16 (50%)	5 (15.6%)	Nil	0.1
Juvenile Nasopharyngeal Angiofibroman=8/97	3 (60%)	Nil	1 (20%)	1 (20%)	0.1
Giant Cell Granuloma of Maxilla/ NPC/ PPS Pleomorphic Adenoman=5/97	3 (60%)	Nil	1 (20%)	1 (20%)	0.1

**Discussion**

Upper respiratory tract infections caused by various viruses are the most common cause of acute otitis media<sup>17-19</sup>. It seems that bacterial otitis media is typically a consequence of a viral illness<sup>20</sup>. Respiratory syncytial viruses are found in the majority of instances of acute otitis media, and even in situations when there is an effusion [21]. Sensorineural hearing loss could be brought on by certain infections<sup>20,22-24</sup>. Its pathophysiology remains unknown. Nonetheless, a lot of theories have

been proposed in the past. The transmigration or diffusion of inflammatory chemicals or mediators across the round window membrane is the foundation of one such idea.

This study focused on the assessment of conductive hearing loss secondary to nasal and nasopharyngeal pathological states. Our study included patients with age more than 15 years having nasopharyngeal obstructions. The conductive hearing loss was present in 100% patients. A study conducted by Ashish Khadgi<sup>25</sup> in which patients

from age 5-15 years were included having adenoid hypertrophy. Out of 98 ears (2 in each patient) in the case group, 69 (79.4%) had conductive loss, while 29 (29.6%) were normal.

In this study, the average age of the patients included was  $28.23 \pm 8.23$  years and mean duration of nasopharyngeal obstruction  $6.81 \pm 4.24$  months. There were 55.67% male and 44.33% female. In a study conducted by Islam<sup>26</sup>, it included 64% males and 36% females. The symptoms presented by the patients included aural fullness (62%), conductive hearing loss (60%), tinnitus (26%), aural discharge (32%) and aural pain (30%). The severity of CHL in the patients was mild loss in 40%, moderate in 14%, severe loss in 6%. In our study severity of conductive hearing loss in patients with nasopharyngeal obstruction was mild loss in 52.58%, 37.11% had moderate loss, 9.28% had moderately severe loss and only 1.03% had severe loss.

In Musani et al study<sup>11</sup>, the secretory otitis media was the second most common cause of conductive hearing loss, and was seen in 57 cases (19%).

Bangladesh<sup>23</sup> found in their study that 42% of the participants had normal hearing, while 58% had hearing loss; 14.2% of OME was caused by minor adenoid enlargement, which resulted in mild hearing loss in 100% of the cases, and 100% of cases had middle ear pressure between -100 and -200. 83% of patients with mild hearing loss and 17% with moderate hearing loss had moderate adenoid hypertrophy (57.9% OME), and 75% of patients had pressures between -101 and -200 and 25% between -201 and -400. 72.7% of cases of OME were due to severe adenoid hypertrophy; of these, 62.5% had mild hearing loss, 37.5% had moderate hearing loss, and 37.5% had pressure between -101 to -200 and 62.5% had pressure between -201 and -400.

Early pathogen colonization of the nasopharynx is linked to the early start of AOM<sup>26</sup>. This in turn is connected to the greater risk of tympanic membrane perforation associated with chronic otitis media (COM) that is observed in the 02-04 age group, about three times higher than the adult

rate<sup>21</sup>. This suggests that childhood rhinitis and nasopharyngitis are more common<sup>22</sup>. Since the prevalence rate of adult-onset OME in a population aged 15 years or older has been reported to be just 6%, it is less common than childhood OME<sup>28</sup>. The direct cause of OME in adults is ET obstruction while indirectly, upper respiratory tract infection (URTI), nasal and nasopharyngeal allergies, nasal obstruction, nasopharyngeal pathologies, barotrauma, poorly pneumatized mastoid, prolonged intubation, autoimmune disease-CSF otorrhea, all may contribute in its development<sup>27</sup>; the main correlating disease remained sinusitis, since 63% patients of adult- OME got a prior URTI. OME is highly prevalent in HIV- infected adults (18% in a series were having COM, mostly OME)<sup>29</sup>. In another series with 48 non-acute OME, 97% got diagnosed with allergy by using IgE level, RAST and skin test. According to our findings, allergic nasal polyps are the leading cause of OME-related conductive hearing loss. Fungal rhinosinusitis and antrocoanal polyps were followed by it. Only fungal sinusitis resulted in moderate conductive hearing loss, while the rest caused mild conductive deafness.

Branchial cysts and Wegener's Granulomatosis have been identified as the etiology of nasopharyngeal lesions in 20% of adult-OME<sup>27, 29</sup>. In our investigation, maxillary giant cell granuloma, pleomorphic adenoma of parapharyngeal space, nasopharyngeal carcinoma, and juvenile nasopharyngeal angiofibroma were the least prevalent cases, accounting for 13.3% of cases and producing mild conductive deafness in t

## Conclusion

According to this study, the degree of conductive deafness is directly correlated with obstructive nasal and nasopharyngeal diseases. Large-scale research of this kind would be more advantageous in order to connect the pathophysiology of otitis media with Eustachian tube occlusion. In that instance, treating otitis media would significantly alter the patients' quality of life. Particularly in cases of nasal and nasopharyngeal obstructive disorders, the commencement and completion of the treatment

plan for otitis media should be delayed until the underlying causes and associated risk factors are understood. Early and effective treatment of these conditions might save these people from long-term consequences, including hearing loss.

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